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ABSTRACT

A computer-based training program was used to teach technical instructors at the Long Island Lighting Company how to create student handouts of textbook quality with a computer, software, and laser printer. All five learners successfully completed the course objective, which was to produce a one-page handout that contained text and graphics, following a one-on-one trial. The handouts of all five learners received the highest ratings when judged against each of the statements on an evaluation checklist developed for the project. Prior to the study, the learners were able to use the word processing (Word Perfect 5.0) and engineering-exact graphics (AutoCAD 9.0) software packages necessary in the study. The computer-based instructional program had been developed with the Summit Authoring System. Whether a learner achieved the instructional objective was determined by judging the learner's handout against the following statements on an evaluation checklist: (1) text lines are readable; (2) text lines are parallel and horizontal with the bottom of the page; (3) graphics image is clear; (4) graphics image is properly oriented on page; and (5) project was completed within 8 hours. (The document includes the instructor's guide and student's guide, a printout of the instructional computer program, and a nine-item bibliography.) (CML)

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Final Examination

of

David C. Paquin

for the degree of

MASTER OF SCIENCE

in

TRAINING AND LEARNING TECHNOLOGY

A Computer Based Training Program for the Development of Student Handouts and Other Training Aids

Abstract

This is a report and examination of the analysis, design, development, implementation, and evaluation of a training program used to instruct technical instructors at the Long Island Lighting Company. The designer selected computer-based training as the delivery method.

The program was delivered to five learners following a one-on-one trial. Using data accumulated through formative evaluation, some program materials were improved. Each learner successfully fulfilled the course objectives, creating a student handout with text and graphics on one page, printed with a laser printer.

Recommendations include securing a sufficient access to laser printers before-hand to avoid interference with the learning process. Additionally, the program could be extended to include more extensive powers of the word processor and graphics software.

Friday, May 19, 1989 at 10:00 a.m.

in

Conference Room, French Chateau
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A COMPUTER-BASED TRAINING PROGRAM FOR THE DEVELOPMENT OF STUDENT HANDOUTS AND OTHER TRAINING AIDS

by

David C. Paquin
B. S. 1984, University of State of New York

A Thesis Project
submitted to the Faculty of the
School of Media and Arts
of the New York Institute of Technology
in partial satisfaction of the requirements
for the degree of

Master of Science

June 11th, 1989

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THESIS/PROJECT

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MASTER OF SCIENCE

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TRAINING AND LEARNING TECHNOLOGY

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My sincere thanks goes out to my fellow trainers who assisted in the successful completion of this project. In particular, the staff at LILCO has been exceptionally supportive in the areas of computer training and development of training aids. It is these two topics which formed the basis of this thesis.

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"May you stay forever young." - Bob Dylan, 1969

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CHAPTER 1

INTRODUCTION

Overview

This document describes in detail the development and implementation of a training aid development training program for technical instructors at the Long Island Lighting Company. The fundamental processes of Instructional Design were followed throughout the program. Included in this thesis are materials related to analysis, design, development, implementation and feedback.

Background

As industrial training needs continue to grow at a record pace, instructors are being hired not only to teach, but to develop new training materials. These materials include lesson plans and a variety of training aids. In the forefront of these training aids, stands the student handout. A student handout, developed properly and administered with the right timing, can go a long way toward information delivery, thereby accommodating the learning process.

The efficient production of quality student handouts requires that instructors be skilled with the best tools at their disposal. The advent of computers, with their word processors and graphics programs, has provided instructors with a

comprehensive and versatile "tool box." However, there is such a wide array of complex software available in the market today, it is literally impossible for instructors to simultaneously maintain proficiency at more than a handful of these programs. Thus, they must carefully select a few software packages based on needs and resources. The introduction of new and better software continually races ahead so that it seems it's never a good idea to settle on present capabilities for an extended period of time. However, the designer believes a plateau has been reached that is worthy to be included in the tool box.

The combination of graphics and text on a single page has, until recently, been a cumbersome affair, usually accomplished with scissors, tape, and copying machine. This combination can greatly enhance the powers of a student handout, both in appearance and in instructional value.

Statement of the Problem

Industrial training has enjoyed a great upswing during recent years. As new training programs are developed throughout an industry thriving on modern technology, the difficulties in presenting accurate and meaningful training aids become as complex as the industries they attempt to describe. In the electrical utility industry alone, a demand is placed upon instructors to provide training on a broad spectrum of components, ranging from microscopic integrated circuits to huge furnaces and boilers. Transferring this information from

technical manuals to usable classroom aids has long been accomplished in a manual, tedious fashion with common office supplies.

For the instructor-turned-developer, the production of training aids, in particular student handouts, has been a task resulting in less than professional looking documents with only medium instructional value. To be able to turn out textbook quality material is an achievement each instructor has frequently pursued yet rarely achieved. Contributing to this problem are the following:

1. Time constraints
2. Low budget operations
3. Acceptance by instructors that they are unable to produce textbook quality materials for use in the classroom
4. Inability to distinguish worthy software packages amongst the vast array vying for the instructor's attention

These four limiting factors can be overcome using the project contained herein, with an end-product well worth the effort.

The production of graphics and text in a training aid at first may be slightly time consuming. However, after the initial learning period, the process becomes routine and is altered and improved based upon the creator's imagination. Soon, time will be no longer a factor compared to the hours that could be spent with scissors and tape.

Budget becomes a factor with many training centers as companies vacillate between periods of economic strength and austerity. However, it is commonly recognized that high quality training pays rich dividends in equipment and plant "up-time."

Adult technical training can be greatly enhanced by demonstrated professionalism in the classroom. This professionalism sets a standard which the students come to expect not only of the instructor but of themselves. Once instructors take on the challenge of producing high quality training aids, and produce textbook quality material their confidence will soar, standards will rise, and performance of instructors and students alike should follow.

The remaining difficulty confronting instructors is the selection of appropriate software packages. The list is without end, and many are without merit. It is the purpose of this project to assist the instructors by selecting two of the best programs available that are not only top-notch, but can be co-ordinated in a fashion that produces text and graphics on a single page.

During the spring of 1989 at the Long Island Lighting Company, a team of instructors, using IBM compatible personal computers, found a combination of a graphics package and a word processor that provides high resolution, engineering-exact graphics with an extremely powerful word processor. The graphics program is AutoCAD 9.0 and the word processor is WordPerfect 5.0.

Purpose of the Project

The purpose of the project is to provide instructors with the necessary computer skills, via computer-based-training, to produce student handouts combining graphics and text. It is desirable for the program to be formatted to stand alone without direct instructor intervention until final evaluation of the learner's work. During the course of the training, the user would create a student handout which is later evaluated by the course facilitator. The project will provide the user with knowledge, skills, and practice necessary to become proficient at producing textbook quality student handouts.

Definition of Terms

Authoring System - A computer-based system which allows an instructor to create an interactive, computer-based training delivery system. The Summit Authoring System is used in this project.

Computer-Based Training - A training delivery method that uses a personal computer as its primary means of communication from which the learner attains certain training goals.

Conversion Program - A software program that modifies a file created by one program so that file may be readable by a second program.

Dacum - An acronym for developing a curriculum, it is a means for performing a job analysis that is based upon holding a workshop with job incumbents.

Drawing File - A file created by AutoCAD identified by a dwg extension.

Extension - The last three characters of a computer file name that identify the type of file. These characters will follow a dot which follows the main file name. Example: electric.dwg is a file named electric with a dwg extension.

Graphics Package - A software package for personal computers whose main function is to produce, manipulate, edit and print pictures.

INPO - The Institute of Nuclear Power Operations that accredits and regulates the actions of training centers involved with the nuclear power industry. INPO supports and provides specific guidelines for implementing the five stages of creating a training program as found in the process of Instructional Design. These stages include, in order, Analysis, Design, Development, Implementation, and Evaluation.

Laser Printer - A recently developed method of printing that combines the high speed and graphics abilities of dot matrix printers with the high quality text of impact or daisy wheel printers.

Plot File - A file created by AutoCAD that has been plotted to a file. In this case, AutoCAD "plots" the drawing to a file instead of to a plotter.

Selected Task List - This is an inventory of items performed by learners once they are on the job. It is used as a basis for setting objectives and developing training materials.

Senior Instructor - A position defined by a LILCO procedure held by trainers that have completed approximately two years of instruction and designated on-the-job training.

Student Handout - Training aids used by instructors at LILCO; these are short, one or two page documents that serve to explain particularly difficult or vague points. This strategy supports the ten rules for using A-V aids co-developed by the designer for LILCO and published in Training magazine (12/88, p. 16).

Technical Instructor - A teacher employed in an industry that has training needs in a field of electronics, electricity, or another field of similar complexity.

Word Processor - A software package for personal computers whose main function is to produce, manipulate, edit and print text.

Assumptions

1. That the user is familiar with WordPerfect and AutoCAD.
2. That the user has access to an IBM compatible computer which has:

   ...been loaded with WordPerfect and AutoCAD.

   ...been upgraded with a math co-processor.

   ...at least 640K RAM.
3. That the user has access to a Laser printer that has been upgraded with at least 2 Meg of RAM.

Limitations

1. This training program was developed specifically for technical instructors at the Long Island Lighting Company and may not be suitable for other organizations.
2. The program is possible only following a significant initial cost unless the organization already owns the necessary hardware and software.

Methods and Procedures

The method used to develop this program was based upon the Interservice model of instructional design. This includes the five specific stages as outlined in the Interservice model: Analysis, Design, Development, Implementation, and Evaluation. This format is re-enforced by the Institute of Nuclear Power Operations which regulates training development and implementation at LILCO as well as other electric power utilities across the United States.

The author has chosen Summit Authoring System for program delivery due to the simplistic nature of its authoring methods and implementation. Summit runs on IBM compatible computers, as do the two software packages involved with the training itself, AutoCAD and WordPerfect.

Analysis

The designer, a technical instructor for LILCO, has followed the needs and abilities of the training industry with regard to the development of training aids for nearly a decade. Further, he performed a specific study of the present needs and desires of technical instructors in the Electric Production industry. These needs were contrasted with current capabilities. Inputs were collected and utilized from three independent sources: 1) instructors, 2) students, and 3) managers.

From this study of the instructor's job, a short task list was developed concerning the use of software to produce high quality training aids. This task list then became a list of performance based objectives as outlined by Mager (1984). In accordance with Mager, the objectives were assigned three components: 1) performance, 2) conditions, and 3) criteria. Criteria became especially important here as the goal was to achieve training aid quality markedly superior to that of any previously created.

Design

The designer was motivated from the start to create a

program that would assist trainers in making high quality training aids. Detailing instructional goal criteria was a method by which the designer could assure high quality in the final student project. Determining specific learning activities was a method by which the designer could provide the skills and required knowledge needed by the learners.

Development

This training program was developed by the designer based upon principles outlined by Gagne (1985) and requirements and guidelines provided by LILCO Office of Training procedures. The development of tasks and objectives followed the guidelines provided to LILCO by the Institute of Nuclear Power Operations.

As the course material is of a computer usage nature, the designer chose a computer-based delivery system. This method provides flexibility in scheduling and allows for students to proceed at a rate determined by their own capabilities. In addition, students, with their programs on disk, maintain a ready reference for review.

Implementation

The course has been presented independently to six technical instructors. Course material was administered via the Summit authoring system; learners worked at their own pace and completed projects within the eight hours allowed by the learning objective.

Evaluation

Data was collected following each presentation. The designer administered six one-on-one presentations; learners were then asked to create training aids as a measurement of their learning goal achievement. Following the fourth presentation, a revision regarding technical material provided to the instructor-learner was made based upon learner input. This revision was tested during the final two presentations.

Summary

Instructors in today's technical industries, in addition to providing instruction, are being required to develop training aids as a part of their job. The proper training aid is a crucial ingredient in the trainer's tool box. In the case of a highly regulated, highly technical field such as electric power production, the need for superior quality training aids becomes even more important.

Frequently a single instructor will be asked to teach courses on an extremely wide range of complex equipment and procedures. As this occurs, reliance upon high quality training material grows. Creating quality student handouts that assist the learners in achieving their goals thus aids the trainer in the performance of his job. As the systems and their components become more complex, the training aids must be created with added flexibility and capabilities.

To perform this task, the modern instructor must turn to the advanced capabilities of computers. Software is available to produce graphics exact to one thousandth of an inch and to produce text in hundreds of formats and fonts. Combining the two, graphics and text, has until recently been cumbersome and time consuming with only adequate results.

The training plan in this project co-ordinates a powerful word processor with an equally powerful graphics package to provide, on one page, excellent student handouts. By setting high standards for their own performance, instructors can lay a foundation for expecting equally high standards for student performance.

CHAPTER 2

ANALYSIS

Introduction

The first step of the Instructional Systems Design approach is analysis. It is implemented when an organization identifies a situation that does not meet acceptable standards. Situations might include poor worker performance, high equipment down-time, or low self-esteem among workers. This step will provide a blueprint around which a training program can be designed and developed. In the case of this project, the designer was faced with the problem of producing high quality student handouts in a technical training environment.

One determination made early-on during analysis is whether or not training can alleviate an identified, unwanted condition. Training is considered, among other options, as a possible solution to a problem. This initial portion of the analysis stage is the Needs Analysis. The designer was able to determine that training was the best alternative to select in order to arrive at an acceptable solution.

Once training has been identified as a viable resolution, the present condition is further analyzed. Job Analysis occurs when the training group takes a detailed look at a worker's job requirements. The product of this analysis is a list of tasks performed by the worker. In this case, a list of tasks was

created that make up the job of creating student handouts and training aids.

Next, these tasks are reviewed in great detail by a team composed of both trainers and subject matter experts. Specific skills and knowledge requirements are listed as a result of this review. This list, together with specific performance objectives, is used to provide a basis for developing training materials. The designer used these three stages of analysis, needs, job, and task, in creating this project.

Needs Analysis

When dealing with profit-oriented companies, consideration must be given to the cost-effectiveness of any training program. If the problem can be solved effectively at a cheaper cost, training may not be the best way to go. Training is measured against other solutions from the standpoint of time and money. Note that for this case, the problem centers around training instructors to develop quality, text/graphics training aids for their classes. Another solution, other than training instructors, would be to hire outside vendors to produce the training aids. While the cost may be high, small work scope might warrant this option.

Job Task Analysis

During this stage, the designer looked closely at the job performed by instructors as they filled the role of training

material developers. In particular, consideration was given to the process of creating training aids for technically-oriented programs. Several job incumbents were interviewed to collect the desired data. As a result, a list of tasks was developed that encompassed the overall job of creating student handouts. The first task list was later narrowed down to a Selected Task List that dealt exclusively with creating student handouts with the computer software the designer chose for this project. This practice is consistent with standards laid out by the Institute of Nuclear Power Operations. For this project, the original task list essentially includes the steps necessary to create a short student handout combining text and graphics using computer software. This list and the Selected Task List are provided in Appendix B.

The process of amassing a task list can take various forms such as Job Analysis, Dacum Analysis or simply collecting tasks from several different resources. When using the latter, the best method is usually to accumulate tasks from each resource available and then massage the list to fit the needs and desires of a particular situation. These resources include (but are not limited to):

1) Lists from other training organizations that train on similar jobs
2) Lists provided by accrediting organizations
3) Lists generated by in-house or contracted subject matter experts

For this project, the designer generated a task list by interviewing two subject matter experts, a method usually considered a component of Job Analysis. These SME's were principally computer experts with training development backgrounds. All LILCO instructors, their names are John Bryant and Bob Shannon. In addition, the designer himself is a subject matter expert. The designer then modified the list following guidelines provided by LILCO Office of Training Procedures. These documents are called OTP's. Excerpts from all project-related OTP's are included in Appendix G.

The trainers must narrow down their task list into a Selected Task List. This is done by identifying those tasks that apply to the specific organization requirements and deleting the remaining tasks that don't apply. In addition, tasks may be excluded if their skills and knowledge requirements are taught by another group within the organization.

Task lists are further narrowed down into groups that are within a common subject such as Basic Electricity or Soldering. In the case of this project, the task list is made up of tasks needed to create the student handout and is not a complete list of all the tasks performed by a LILCO instructor.

Target Population Analysis

The learners selected by the designer are all technical instructors for the Long Island Lighting Company. The project material could be useful for instructors involved in course ware

development in a wide range of studies. However, those instructors in technical areas would seem to benefit the most. It should be noted that the organization must have a serious commitment towards quality training as demonstrated by investment in a powerful computer - with at least 640K of RAM, hard disk drive, and enhanced graphics capabilities, in addition to expensive software, and a laser printer.

The learners involved with the project at LILCO all have previous experience with computers, specifically (and necessarily) with AutoCAD and WordPerfect. This is an asset the designer considers an entry level skill. Thus, a proper target population description would include experience with word processors and graphics programs, specifically WordPerfect 5.0 and AutoCAD 9.0.

The target population, then, can best be described as one that exhibits each of the following three characteristics:

- involved in training aid development
- working in a technical field
- experienced with AutoCAD
- experienced with WordPerfect

Note that the inclusion of AutoCAD and WordPerfect-specific experience is a result of the fact that the designer's training program is but a small component of the overall process that takes place in the instructor's complete training program.

Organizational Constraints

The designer determined that a computer authoring system would provide the ideal delivery system. This strategy, while appropriate for instructors at the Long Island Lighting Company (LILCO), may not meet constraints imposed by other training organizations. However, not all instructors at LILCO had their own computers which slowed the training process somewhat. Ideally, each learner would have an IBM compatible personal computer with the capabilities outlined in chapter one, page eight.

The very best of conditions for training aid development would be ones that allowed access to computers and laser printers by instructors whenever this access was necessary. The situation at LILCO seemed much better with regard to the computers than with the laser printers. This was largely due to the fact that individuals were willing to provide their own computer. In addition, under the best possible conditions, extensive instructor training would provide the software skills and know-how necessary to produce high quality training aids.

In summary, the constraints at LILCO include:

- Less than extensive instructor computer training
- Insufficient availability of computers
- Insufficient availability of laser printers

Instructional Goal

The instructional goal for this project is as follows:

...the technical instructor will be able to produce training aids that combine graphics and text via laser printer in text-book quality.

This goal is an end product of the task analysis process.

This project will provide training in the areas needed to acquire the skills necessary to create a training aid that incorporates text and graphics using AutoCAD and WordPerfect. These skills include the ability to:

- manipulate files with AutoCAD
- convert files for use between AutoCAD and WordPerfect
- insert graphics files into WordPerfect text
- print documents from WordPerfect with a laser printer

Instructional goals, in theory, are the result of job and task analysis. In reality, many times the instructional goal is a direct result of a need recognized by trainers within their specific fields. In the case of this project the goal was shaped by the latter and perfected by the former. The designer recognized the need for high quality training aids in the technical-industrial training field. Successful training mandates a minimum quality; effective instruction is built upon superior training aids.

With this in mind, the designer wrote the fundamental instructional goal that learners would be able to create student handouts combining graphics and text through the use of computer software and a laser printer. The goal was further defined through job and task analysis. This analysis resulted in

specific criteria, performances and conditions so that clear learning objectives could be established.

Literature, Existing Course, and Material Review

The designer consulted various sources for material that would provide instruction on making training aids using AutoCAD and WordPerfect. These include magazines and journals, electronic bulletin boards, an ERIC search from the NYIT library, and textbooks. In each case, the search was initiated from each of two aspects. The first was making training aids and the second was using computer software. Some related theory became available to the designer nearly a year prior to the project's inception.

Related Theory

During the Spring of 1988, the designer attended a course entitled "How to Make and Use Media Workshop" at New York Institute of Technology. The instructor, Dr. August K. Spector, is a supervisory and management development specialist with the U.S. Nuclear Regulatory Commission and founder and president of the Federal Educational Technology Association. During the course, Dr. Spector discussed the many values of quality visual aids. He provided a list of material selection criteria as follows:

- Meet learning needs
- Reflect up-to-date and accurate content

- Present at level of group
- Encourage thinking and inquiry
- Suggest other learning activities
- Maintain good technical quality
- Have esthetic appearance

With regard to visual aids, Spector says they should be used to help learners visualize key information, noting that vision is the prominent sense.

Spector summarizes much of what he covers in class by describing how the instructor's role has changed over the last two decades. Due mainly to recent technological developments, he sees the trainer's role as changing from a manager of learners to managers of information. The instructor's role, he says, has shifted to that of a facilitator who works with subject matter experts, audiovisual specialists, computer specialists, and other technical and non-technical specialists. In this sense, the instructor becomes responsible for managing the overall process of learning. The traditional roles of the human resources developer have been influenced by the advances in technology. The developer's skills, knowledge and attitude require reevaluation and redirection. This, Spector concludes, is an exciting time for the developer of human resources.

Literature Review

An ERIC search was performed and no previously developed training material was found that provided specifically the same

training as this project.

Survey of Existing Courses and Materials

As this program is extremely specific, no other programs were identified that attempt to reach exactly the same instructional goals. Other programs either dealt with just the software or just the training aid aspect. These are described here.

Software training comes in one of four forms. These four forms are:

- Contractors, or vendors, who specialize in a software program
- Computer-based tutorials included with the software
- Manuals included with the software
- Instructional manuals provided by third parties

Contractors are usually very expensive and only available for short term, intensive training. For example, LILCO hired a vendor to provide three days of intensive AutoCAD training to two draftsmen. The training was given over three weeks where learners met with instructor for eight hour periods. The draftsmen then shared their knowledge with others at the training center.

The second way is where the software supplier, such as the distributor of WordPerfect, provides a computer-based tutorial with the software. This is very inexpensive and allows learners to advance at their own pace. A disadvantage is that once users become skilled with the program and want to utilize its more

powerful features, they find the tutorial suddenly inadequate and unable to answer their specific questions.

A third method occurs when new users attempt to teach themselves from the manual that accompanies the software. This strategy is often frustrating as the manuals are not written to be as user-friendly as is usually claimed. Generally, they are poorly organized and not structured in a fashion that enhances training. Unfortunately, this manner of learning software is probably attempted the most, both creating a great deal of frustration and wasting valuable time.

The fourth common approach is one in which the learner goes out and buys a book on the software from a bookstore or computer store. Though once a difficult process, this has become increasingly easy and effective. The learners will have a handy reference that stays with them, answers all their questions and is not too expensive. Book publishers are aware of this growing market and have responded by providing manuals, for novices as well as experts, on nearly every popular software program.

For example, (as of the spring of 1989) B. Dalton Bookstore at the South Shore Mall in Bayshore on Long Island has incorporated a store within a store that carries hundreds of volumes of software guides, each providing specific instructions for software packages ranging from spread-sheets and word processors to artificial intelligence languages and graphics programs. Average price is about twenty dollars.

The chief disadvantage with this type of learning process is

that the learners are forced to acquire the knowledge without benefit of an instructor or of a structured program designed specifically for their instructional goals. Nonetheless, this method is becoming quite popular as evidenced by the growing number of books being made available via a growing number of outlets. Even Price Club, principally a combined grocery/appliance discount outlet on Long Island, has devoted a section to computer software manuals.

Training with regard to materials development is usually provided by the organization as part of the instructor training program. This is done so that material is developed following a standard format and meets certain requirements. These requirements may deal with industry regulations such as those levied by the Nuclear Regulatory Commission or other rules established by local or national governing bodies.

LILCO provides its instructors with an on-going training program that includes lesson development among several other topics. Great emphasis is not placed on developing high quality training aids as a matter of time and money constraints. Rather, it is left to individual instructors to set their own high standards.

Plan for Project

As a result of the analysis phase of this project, the designer pursued the development of a training program such that learners would be able to create student handouts combining

graphics and text through the use of computer software and a laser printer. Characteristics of the program would include the following:

- Low cost
- Instruction specific to learner's present needs
- Allow learners to proceed at their own pace
- Provide structured instruction that results in the production of high quality training aids

Project Plan

The designer used a Gantt chart to monitor project progress. The use of this chart enabled periodic review of progress to ascertain when and if additional steps became necessary to complete the project on schedule. The Gantt chart is included in Appendix E.

Budget

For this project, costs are nearly zero; it is simplified, then, to rationalize program selection as a means of solving the identified problem. Still, the following may be considered:

Note

Designer's development costs were computed at an hourly rate of $75/hr (typical for the industry). Additionally, LILCO instructor rates are approximately $15/hr.

1. Cost

Computer Software	$100
Workbook	$10
Development Time (20 hrs x $75/hr)	$1500
Training Time (2 hrs x $15/hr)	$30
Materials (paper, disks, etc.)	$20
Pro-rated computer use (10 hrs x $2/hr)	$20
Total	$1680

2. Cost-Benefit Analysis

Development time for graphics/text handout is reduced from approximately 16 hours to approximately eight hours (per handout). These figures are based upon observations resulting from a field test performed by the designer during the analysis stage. This data is provided in Appendix A and has been reviewed and described as a conservative estimate by one of the designer's peer, technical instructors. It can be seen, then, that eight hours of material development time is saved per handout.

Eight hours times $15/hour = $120

Thus, $120 is saved each time a training aid is developed. Between five technical training instructors at LILCO, an average of five training aids are created each week. At $120 each, a savings of $600 per week would be realized. However, the pro-rated computer cost of $20/wk

continues; thus, at $580 saved per week, the program will pay for itself in 1680/580, or 2.9, weeks.

3. Quality improvement

   In addition to saving dollars, it is the designer's primary objective that developers turn out training materials far exceeding previous efforts in quality and, therefore, training value.

It will be seen that this project may be an excellent choice for solving the training aid production problem. Thus, as a result of Needs Analysis, training, and specifically this program, is selected as an appropriate strategy for providing a solution.

Summary

Analysis indicates that a need exists for a training program that will enhance the development of training aids within the technical field. This program should include the following characteristics:

- Low cost
- Instruction specific to learner's present needs
- Allow learners to proceed at their own pace
- Provide structured instruction that results in the production of high quality training aids

Analysis demonstrated that the designer needed to develop a program that would meet both skills and knowledge requirements necessary to allow learners to produce training aids with AutoCAD

and WordPerfect. Thus, the designer formulated a mainly cognitive, instructional goal, based upon detailed task analysis. While some psychomotor skills are necessary to perform the task, they are minor and not considered part of the training program's objective. An interesting product of the analysis stage resulted from interviews with instructors (prospective learners): they each had the desire to produce higher quality training aids but were not being furnished the necessary know-how by management. While most of the equipment, other than laser printers, was available, the needed skills were not.

CHAPTER 3

DESIGN

Introduction

From the start, it was the designer's intention to author a training project that would set new, high standards to be followed by trainers in the production of training aids, thereby raising the level of professionalism in the classroom. It was during the design stage that the opportunity to itemize and detail the requirements for quality was realized. This quest for superior classroom training aids motivated the design stage engineering, which in turn supplied the groundwork for training program development.

While job analysis presented a list of tasks, those tasks must now be further analyzed, via task analysis, to determine the skills and knowledge requirements that the program must provide to the learner. Note that task analysis may be considered part of the Analysis stage or part of the Design stage of any training program as it contributes significantly to both. The designer also determined entry behavior, set evaluation methods, and specified learning activities. Detailed task analysis begins where the designer left off with the formulation of a Selected Task List.

Instructional Task Analysis

Once a Selected Task List has been identified, the training organization can move forward to task analysis. Note, however, that a task list is never complete; it is always subject to deletions, additions and modifications based upon changing work requirements. During the task analysis stage, tasks are reviewed and detailed on task worksheets. A task worksheet is simply a document used to outline and analyze task related material.

At this point, individual steps performed within a task are identified. These steps form building blocks, called enabling objectives, upon which training materials are created. Supporting information, which the SME considers necessary for proper task performance, is identified and enumerated on a list of skills and knowledge. The end product of the task analysis stage, then, is really two independent but related outgrowths; these are 1) enabling objectives and 2) skills and knowledge requirements.

The designer established a team of two subject matter experts, including himself, to perform the task analysis. During this stage the tasks were evaluated in detail with software procedures and OTP's in hand. Each task from the selected task list was reviewed by each team member. Both members compiled the two end products discussed above. These lists were then combined and amended.

The task analysis sheets are contained in Appendix C. Appendix D lists the enabling objectives as well as the skills

and knowledge requirements. The information contained in Appendix D, then, delineates the topics included in the training program.

Instructional Objectives

When considered together, the enabling objectives can be compiled into a single terminal objective. This terminal objective represents the overall instructional goal of the training program. Often, in technical training, each lesson will have a specific terminal objective associated with it.

The most popular and thorough dissemination of objectives is one presented by Robert Mager. In his discussion, Mager points out that objectives, when properly written, include the following three components:

1) Performance
2) Condition
3) Standard

The performance describes the basic function which is to be performed. For this project, the performance component of the terminal objective will be to produce a student handout that combines graphics and text.

A condition describes the circumstances or stipulations under which the objective will be performed. It might include items such as:

1) Given the necessary technical manuals...
2) Given the proper tools...

3) Given a calculator...

The designer has selected the following as conditions for this program's terminal objective:

> Given an IBM compatible computer, laser printer, technical subject matter information, AutoCAD Version 9.0 and WordPerfect 5.0...

The final component is the standard. A proper standard is very important as it provides guidance as to how well the objective must be performed by the learner. It should be noted here that exams, whether written, oral, or performance based, are designed around objectives. The best measure of a learner's achievement of training goals from a training experience is demonstration of the terminal objective.

It is important, however, that the objective be performed up to standards required by procedures or other guidelines. Thus the learner can take to the workplace a skill obtained in the learning environment up to par with on the job requirements. It is also important that objective standards be discussed with students so that performance quality requirements can be set early on. Standards become particularly important as technology advances; mechanical and electrical clearances and tolerances become more exacting and technicians are being required to keep up with those demands.

In the case of this project, the standard plays an interesting role for two reasons. One, the end product will be of superior quality (appearance-wise) than any training aid previously made

by the trainer. This means that a quite high standard should be set to adequately challenge the learners. Secondly, the level of quality is difficult to objectively judge. While many objective standards are easily measured, it is not so easy to gauge the quality of computer generated document. For example, the following standards are easily assessed:

1) Perform within five minutes.
2) ...to weigh five pounds plus or minus one pound.
3) ...with no misspellings.

Thus, the designer was faced with the dilemma of having standards that are very high, but not easily appraised. At last, the following standards were fit into the terminal objective:

1) ...with no spelling errors
2) ...with no uneven text lines
3) ...with no unreadable text
4) ...with informative, distortion-free graphics
5) ...in one day

Having formulated these components to the terminal objective, the designer wrote this objective as follows:

> Given an IBM compatible computer, laser printer, technical subject matter information, AutoCAD 9.0 and WordPerfect 5.0, the student will produce a student handout combining graphics and text. There must be no spelling errors, no uneven text lines, no unreadable text, and the handout will include informative, distortion-free graphics. The project must be completed within one eight hour day.

Establishment of Required Entry Behaviors

The extensive use of computer software necessitates strict entrance requirements. Learners must be able to use both AutoCAD and WordPerfect. They should be instructors involved in development work within their field. The learners should have a basic understanding of the function and potential learning enhancement capacities of a student handout. Beyond these prerequisites, learners with practically any background are likely to succeed in, and can gain substantially from, the training program. Entry behavior requirements can be summarized as:

1. Experienced with AutoCAD
2. Experienced with WordPerfect
3. Involved in training system development
4. Familiar with learning activities associated with student handouts

For this project, the pool of learners consisted of LILCO technical instructors. As AutoCAD and WordPerfect are currently being used by this group, entry behavior requirements were easily met.

Group and Sequence Objectives

Tasks should be grouped according to similar skills and knowledge requirements called for by each task. This grouping is performed as a first step towards organizing a structure to the training program. As this designer's program includes training

on only two tasks, task grouping was not appropriate.

Learning objectives should be sequenced according to a strategy selected by the designer. It may be desired to proceed from simple to complex or it may be desired to group objectives according to similarities among them. For this program the designer grouped objectives logically according to when, in the sequence of producing a student handout, they are utilized. Thus, the designer chose to teach the objectives in the order in which the learner will use them. This sequencing is summarized in Appendix D.

Learning Activities Specification

Learning activities took place along two avenues during the implementation of this program. First, the learners absorbed the material from the course delivery system. Second, some learning took place as the learners created their projects with a hands-on creation of a course project.

The designer selected a computer-based delivery method as the principal learning activity. Each objective is covered by one or more screens within the computer-based deliver system. The designer selected the Summit Authoring system as a means of course delivery. Computer-based training provided the following advantages:

- Allowed learners to proceed at their own pace
- Allowed learners to proceed when they had the time to devote towards training

- Provided training via an environment with which they had easy access during their work day, allowing them frequent and fast in/out access to the training material

In Selecting and Developing Media for Instruction, Anderson divides computer-based-training systems into three categories:

- Dedicated network systems
- Shared network systems
- Independent or stand alone systems

Dedicated network systems typically consists of a large number of student terminals connected to a large central computer by telephone or other cabling system. The computer system is dedicated in that it is used only for instructional purposes. Shared network systems are very similar except that the computer hardware is also used for other functions such as payroll and billing. Note that for shared systems, costs go down but response time goes up. Characteristics of network systems include:

Advantages

- Maximum security of course materials and records
- Quick updating of course materials and records
- Terminals interact over long distances
- Network systems offer a variety of capabilities such as light pens or touch sensitive screens
- Hardware is cheaper than with a shared system

Disadvantages

- Can be difficult to justify costs
- Students can abuse the communication system
- Breakdowns in the central processing unit will affect every student

In contrast with network systems are stand alone or independent systems. These are self contained terminals, each unit totally independent from the other units, providing maximum curriculum flexibility. Characteristics include:

Advantages

- Least expensive
- A breakdown of one processor does not affect other students (no interaction is necessary)
- Response time is faster
- A wide variety of commercially produced courses are available for lease or purchase

Disadvantages

- No centralized location for gathering, receiving or updating data
- Software revisions must be delivered to each student individually
- Gathering test results can be cumbersome and time consuming

The designer chose the stand alone type computer delivery system based upon the above listed attributes. Of primary concern were cost and flexibility. The designer decided to make

available to students the ability to deliver their completed course project via modem.

In particular, the Summit program was selected for its ease of use and management capabilities. The program is almost entirely menu driven and provides few stumbling blocks, even to the novice user. Summit can facilitate a range of graphics outputs, can administer exams and allows branching of the training activities based upon learner performance.

Assessment System Specification

Learners were required to create a training aid that combined graphics and text. Proper achievement of the learning goals was measured by applying the criteria components of the terminal objective while judging student's projects. This criteria included:

1) ...with no spelling errors
2) ...with no uneven text lines
3) ...with no unreadable text
4) ...with an informative graphics image free from distortion
5) ...in one day

Thus, the designer was able to objectively critique the learner's projects as they were completed. In order to provide a means of consistently providing objective evaluation, an evaluation guideline checklist was written. This checklist is provided in Appendix G.

Evaluation System Specification

The designer evaluated the program using both formative and summative techniques. During the learning process, data was collected from learners as they overcame perceived problems with the program. Collection was performed via a data-sheet filled in by the designer during spot checks of learner progress.

Following completion of the program, the designer interviewed each of the four learners to summarize their ideas and concerns regarding future use of the training program. A summative evaluation was then formulated in order to determine if the material presented was appropriate for the work being performed on the job. This data was tabulated and summarized in Appendix F, Formative and Summative Evaluations.

Learning Transfer System Specification

The LILCO training center incorporates a feedback system in its training program via the Office of Training Procedures that checks on the learners' transfer of their training to on the job activities. This is accomplished through two feedback forms known as three month and six month questionnaires. Following the specified time period after the training is complete, the form is sent to the learner's supervisor. The supervisor works with the subordinate to fill out the questionnaire. Questions are designed to determine if the learning objectives are being applied to the job and if the job performance has improved due to

the training efforts. The designer will use this format to verify a learning transfer to job activities.

Review and Selection of Existing Materials

The two sources pursued by the designer, ERIC search and electronic bulletin board, produced no training programs that covered the specific learning objectives identified in this project. Related programs provided information specific either to AutoCAD or WordPerfect (never both) or provided general information regarding desktop publishing. Examples include the following:

- Without training, users run amok making ugly documents, by Gralla-Preston appeared in PC Week, volume 4, issue number 18, May 5th, 1987. The article discusses the need for proper training with regard to desktop publishing.
- Training can sensitize users to the basics of good design, by Gralla-Preston, appeared in same issue as article above, and discusses how more successful use of desktop publishing can be found through training.
- WordPerfect enjoys 'crisis' growth, plans to develop for many systems, by Flynn-Laurie, appeared in InfoWorld, volume 9, issue number 10, March 9th, 1987, page 27. This article discusses the great progress in desktop publishing by WordPerfect and their plans for the future. Unfortunately, March

of 1987 goes back a little too far for the purposes of this project. It was since then that version 5.0 was released which included the extensive graphics capabilities.

None of these sources was chosen for possible inclusion with the designer's project.

Summary

Within the design stage was the opportunity for the designer to initialize the stringent quality requirements that would set training aid production in a new class. By looking closely at individual tasks, the designer was able to accomplish several chores, including the identification of specific learning objectives and the determination of learning activities that will provide attainment on those objectives. In addition the designer designated formative and summative evaluation methods as well as training follow-up questionnaires designed to verify the effect of learning activities on job performance. These documents were fundamentally results of LILCO procedures. Around these accomplishments, and based upon task analysis, the framework around which the designer developed the training program was formed.

CHAPTER 4

DEVELOPMENT

Introduction

The most exciting opportunity in a trainer's career must be to create a training program from the ground up, including analysis, design, development, implementation and evaluation. Of these, the chance to truly leave a signature comes best in the development stage. Here trainers invent; they write a story, with beginning, middle and end, and with a plot they hope will entrance and motivate their audience, the learners. It was with this enthusiasm and drive for success the designer entered the development stage of this project.

During the summer and fall of 1988, technical instructors at the Long Island Lighting Company began to sort through many different software programs in an attempt to produce extremely high quality, technically oriented student handouts that combined text and graphics. Their search led them to the selections used by the designer's project, AutoCAD and WordPerfect; suddenly they were producing intricate lab handouts with electronic schematics and short paragraphs of accompanying text.

Learning Activity Development Scheme

The designer found that many instructors were not familiar with how to combine the abilities of AutoCAD and WordPerfect, and

were a bit intimidated by the hundreds of commands available within each. The designer began seeking an orientation for training the instructors on the methodology behind the creation of the new handouts that was relatively simple yet inclusive of the necessary skills. Following an analysis stage, a computer - based delivery system was developed that provided the learning activity for most of the identified objectives. Then a short handout was developed that accompanied the software to complete the training project.

Learning Activity Development

During the first week of December, 1988, the designer identified the major steps that would take place during the development stage. These included the systematic and sequential authoring of the following:

- Course Outline
- Instructor Guide
- Summit Computer-Based Delivery System
- Student Guide
- Evaluation Guideline

Development goals were set by assigning dates for completion of each of the above items. The schedule allowed two weeks for the outline, four weeks for the instructor guideline, six weeks for the Summit program, two weeks for the handout and another two weeks for the evaluation guideline. Much of the development work on the various components was done concurrently. A Gantt chart,

summarizing this schedule, is provided in Appendix E.

The course outline was written in a week, one week ahead of schedule. This outline was based on the depth of skills necessary to perform the terminal learning objective. The designer scheduled learning activities in an order that would best meet the needs of the learner. The course implementation had to be flexible and versatile enough to allow students to enter, exit, and repeat the training experience as often as their jobs warranted. Computer access time and job demands away from the office were two characteristics of the learning environment that made flexibility a requirement. As a result, most of the training activities occur via computer-based delivery.

In addition, the course outline needed to include initial course entry and final course exit. When provided with this outline, then, the learners would understand where they started and where they were headed. The course outline is included in Appendix F.

The instructor guide was created in order to provide instructions to instructors, also referred to in this thesis as course facilitators, that would guide them from beginning to end of the project. It includes the learning objective, time requirements, and a step by step procedure for implementing the project. Noted in the guide is the fact that the course is meant to be self-paced, although the facilitator is directed to maintain progress checks on the learners.

The designer wrote the instructor's guide by simply applying

the course information to a lesson plan development procedure used by LILCO. This format places great emphasis on objective learning, as are all facets of training regulated by INPO. Little technical information is contained within the guide, instead it provides a road-map the instructor can follow to implement the project. Thus, details of AutoCAD and WordPerfect are not kept here; they are instead provided on the student Summit disk. The instructor guide is provided in Appendix F.

The Summit program was scheduled for six weeks but fell behind due to software problems. Specifically, as a student version was being used, a command had been built in to the program to cause it to fail after a certain date had been reached. The designer discovered this while talking with another CBT author who had the same problem. Summit corrected the deficiency free of charge by sending new files. In the meantime, the problem was fixed by resetting the computer's internal calendar to January 1st, 1987.

The computer-based delivery system was developed via a menu-driven authoring program that is built in to the Summit Authoring System. Graphics, text, branching, questioning, and record keeping all can be accomplished within the Summit software. The designer had recent experience with this software and therefore had little problem in authoring this portion of the course. A series of text pages were written, accompanied by appropriate graphics, that provided instructions to the learner in the creation of training aids with AutoCAD and WordPerfect. With the

branching capabilities of the program, the designer was able to offer the learner the opportunity to go back and review selected portions of the learning process as desired. The graphics were created based upon the program being delivered with the use of an Enhanced Graphics Adapter, a level of video enhancement common with AutoCAD users. Once a writer has attained minimal experience, the ease with which a short instructional program can be authored is striking.

The designer developed a student guide that would help organize the learner's activities and serve to reinforce the criteria of the instructional goal. This guide provides specific, step by step instructions to the student in addition to information on how to access the instructor. Scheduled for two weeks, this component was completed on time.

Last in the development scheme was the evaluation guideline. The designer considered this document very important given the nature of the project's goal. The two week plan for completion was exceeded due to the desire by the designer to produce a tool that was truly objective and comprehensive but not cumbersome to the point of becoming unusable. Various evaluation methods were considered and reviewed before the designer identified the checklist version as being the most appropriate for the project's needs. Advantages provided by a checklist include:

- easily identified minimum requirements
- ability to specifically call out quality stipulations
- ability to coerce evaluator to make judgement calls

- evaluations of various projects are easily compared and categorized
- overall evaluation difficulty is greatly reduced, improving speed and quality of evaluation

This evaluation checklist is provided in Appendix F.

Development of these training materials was in accordance with INPO guidelines. These were adopted from Briggs and Wager (1981) and follow and support nine training events. The events and how they're provided by the designer's project are shown in Table 1.

Table 1 Learning Events and Their Use by This Project

	EVENT	METHOD
1.	Gaining and maintaining attention and motivating trainees	Use of Computer-Based-Training
2.	Informing the trainee of the learning objectives	Student handout
3.	Eliciting recall of previous knowledge	Contained within Computer -Based-Training
4.	Presenting the training material	Computer-Based-Training
5.	Providing learning guidance	Periodic check-ups by course facilitator
6.	Eliciting mastery of learning objectives	Student's creation of training aid
7.	Providing performance feedback	Reviewing training aid with student
8.	Evaluating trainee performance	Evaluating training aid with check-list
9.	Enhancing retention and transfer of training material	Investigating future work via feedback forms

Learning Activity Review

Following initial completion of development of the four learning tools described above, each was reviewed. This review was performed prior to implementing the program with the purpose of honing these tools before they were used. Specific reviews and purposes are described here.

Initially the four tools were reviewed by the designer, who was also the developer. This was done to:

- Locate and repair any typographical, grammatical, or other obvious content errors
- Ensure the project was a complete package that met all the learning goals
- Identify and correct any software problems that might arise as the delivery system was run on IBM compatible personal computers.

Secondly a review was performed by two subject matter experts. These were technical instructors at LILCO experienced with WordPerfect and AutoCAD who were involved in discovering the capabilities of these programs to produce the student handouts.

Materials for Evaluation Produced

The development of necessary components of the program included the production of four parts. These are:

- Student Guide
- Instructor Guide
- Project Evaluation Guideline

- Computer-Based Training Software (Summit)

Sufficient copies of each of the above were developed to allow for simultaneous technical and typographical review. The revised editions were then printed out in necessary quantity to allow for course delivery to four learners.

These materials, including a computer printout of the student Summit disk, are provided in Appendix F. A format that follows the criterions imposed by LILCO was used during the development of the instructor and student guides.

Summary

During the development stage of this project the designer enthusiastically pursued the physical creation of the components to be used during the learning process. Four documents were thus developed, including the course outline, compute-based delivery software, instructor guide and evaluation guideline. Development was based upon nine training events provided by Briggs and Wager.

LILCO procedures, influenced by INPO requirements, provided formats used in this development. Following the initial authoring each component was reviewed by designer and by subject matter experts. Appropriate corrections were made before the program was administered to the first group of learners.

CHAPTER 5

IMPLEMENTATION

Introduction

Perhaps the most difficult aspects of creating any new training program lie in accurately predicting the workability and value of its implementation and implementation method. How will the battle plan fare on the front lines? One great stumbling block is that all learners are different; thus the trainer must somehow write a program that will be flexible enough to meet the demands and peculiarities a variety of learners. This project's designer was fortunate enough to know his learners well and in advance of the learning activities. Even with this advantage, unforeseen difficulties inevitably present themselves in the forms of:

- software glitches
- "hidden" typographical errors (invisible to the designer but so obvious to the student)
- equipment failures

It was during the first course delivery that these snags announced themselves to both learner and facilitator. The designer monitored this initial implementation closely to identify and correct these unplanned events. The occurrence of several minor glitches came as no surprise as it is so common when courses are first delivered to learners. The designer, in

his position as lead instrumentation instructor for LILCO, has delivered many neoteric courses and the occurrence of unpredicted obstacles has been a common characteristic. Instructors need to be aware of this natural occurrence and prepared to handle the side effects of implementing maiden lessons.

Materials for Implementation Reproduced

During the implementation phase, the designer reproduced sufficient student handouts to deliver the project to six learners. Only one instructor guide and one evaluation guide were required. Extra copies of all these tools were maintained on disk in two separate locations. All materials were printed out on a laser printer in proper format to meet all LILCO and INPO requirements.

The Summit student disk was copied six times to allow for distribution to learners. It was later determined that each disk should contain the DOS "command.com" file to allow learners to boot up their systems with this disk. The modified disks were then reained on file. For access to a disk, see Appendix H. In addition to being provided in this thesis, all course related documents and software were put together in a course file, as required by LILCO procedures. These files are normally maintained in a secure file room which incorporates certain fire protection and security measures. For this project, the designer maintained two files in two separate locations. The required contents of these files are:

- Course description
- Learning objectives
- Lesson plan
- Attendance sheets
- Student evaluation
- Student evaluation results

Thus, the project, in the form of paper and software, was produced to allow for implementation and proper storage. These measures provided both for initial implementation and later revisions and implementation. All files were maintained on disk via WordPerfect and Summit programs.

Instructional Delivery

This project was delivered on a one-on-one basis, first to one student, then three students and later to two more. A short time period elapsed between the first student's delivery and the others, allowing for corrections of errors that became obvious upon implementation. Corrections were minor and consisted of:

- adding a DOS startup command to the student disk
- slightly modifying the student handout to include instructor identification and access information

The designer was course facilitator for each of these deliveries. The first, and each subsequent, delivery was performed by simply following the instructions on the instructor guide:

- give student handout and disk

- discuss learning objective
- check on progress
- discuss learning objective again when final project is started
- collect project and evaluate with evaluation guide

For the initial implementation, a learner was selected who had an avid interest in attaining the instructional goal and who had recently taught himself AutoCAD and was in the process of learning WordPerfect. He had a strong, positive attitude towards learning, was flexible toward learning activities, yet was able to provide constructive criticism toward the project.

The designer closely followed the learner's progress that lasted approximately two weeks. Problems encountered as well as positive aspects were noted. Some minor corrections were made before subsequent delivery to the next learners.

Shortly thereafter, the project was delivered to three more learners. They were advised to proceed at whatever pace fit in with their work schedule. Again, the facilitator took notes as to progress and problems encountered. These learners had a variety of backgrounds, although each met the entry requirements described in chapter three. They were all technical instructors at LILCO and all had easy access to computers.

A significant stumbling block was in access to a laser printer. In fairness to the students, they needed to print out their project in order to see what it actually looked like. They could then make corrections and print it out again for turning in

to the instructor/facilitator. As it was necessary to borrow the laser printer from another department, this became cumbersome as the number of learners grew. It became necessary for the facilitator to take student projects, in rough form and on disk, and print them out after normal working hours. Then the rough projects were returned to the learner for modification. In some cases, the instructor provided guidance at this point. Following modification, the facilitator again took the project on disk and printed it out after hours.

The three learners completed the project in time frames ranging from two days to three weeks. They were not pushed for early completion as it was necessary that the learning process did not interfere with daily work requirements. The learning activities proceeded much more smoothly than with the first learner, due mainly to the facilitator's knowledge of what to expect.

It was following this second delivery that several modifications were made to the program, based upon formative evaluation data gained during oral interviews with the learners. Since the program was now being delivered on a computer other than the designer's, it was found that sub-directories had to be re-named to match those referenced by the original Summit program. In addition, limited capabilities of both disk size and RAM resulted in limited success with file transfers between programs. The greatest success was found when the learner performed all the necessary manipulations with files existing on

the hard drive.

Finally, the project was delivered to two additional learners. These were technical instructors whose specific field was different than the course facilitator's. As these learners were not as well known to the designer, this opportunity was well suited to further test the flexibility of the project. Again, the implementation was undertaken simply by following the instructions laid out in the instructor guide.

The new learners were given the materials called for by the instructor's guide. They were then allowed to work with the material at their own pace. Some frustrations arose as one learner was not sufficiently familiar with WordPerfect and needed additional tutoring from the course facilitator. Otherwise, the learning activity proceeded without fault. Within two weeks, the learners printed out quality student handouts that met the learning objective requirements.

It was interesting to note that each of the six learners was very pleased with their results and all seemed to respond well to constructive criticism from the facilitator. In each case, the learner expressed a desire to hold on to the learning activity materials (principally the student tutorial disk).

Data Collection

Certain learner responses, as well as indications of instructional goal attainment, were collected by the designer to form a summative evaluation. The objective of such an evaluation

was to determine whether the delivery method had performed as well as planned. Did the learners meet their goals under these conditions or would another strategy be more appropriate?

Indications were gathered via several documents to make the proper determination. LILCO procedures are provided to meet this specific need. Two of these include the three and six month feedback forms that are sent to the learner's supervisor an appropriate amount of time following the training activity. These forms are filled out by supervisor and student and are returned to the training center for evaluation. As of the writing of this document, neither time period has elapsed. However, summative data were collected via:

- questionnaires
- evaluation of student projects

The questionnaire was designed to identify weaknesses and strengths as perceived by the learners. Questions inquired about the usefulness, technical accuracy and delivery of the course materials. The questionnaire is included in Appendix F.

In addition to the questionnaire, summative evaluation data was also tabulated by measuring student achievement of the instructional goal. Each student project was evaluated through the use of an objective evaluation instrument and was therein designated as acceptable or unacceptable. This instrument, in the form of checklist, is provided in Appendix F. A comparison of the number successful against the number unsuccessful would provide some indication of the appropriateness of the delivery

strategy under the given conditions.

Summary

Initial implementation of any training program carries with it the risk of unpredictable pitfalls that can only be identified through actual trial in the learning environment. Thus, the designer cautiously implemented his project, wary of the unforeseen. Although the first audience seemed to be a known quantity, it was also a critical one, veterans of the training industry, quite aware of the specific requirements and policies imposed by both INPO and the Long Island Lighting Company.

Simplicity was apparently one saving grace of the project, as not much room was available for critical comment. Either the short, explicit delivery performed or it did not. As most of the learners were avid computer users, computer-based delivery was naturally popular. This, combined with the successful attainment of the learning goals apparently overcame some minor difficulties as the program was generally held in good, if not high, regard.

CHAPTER 6

EVALUATION

Introduction

The designer sought to measure the total value of this project via formal evaluation. The production of student handouts with sophisticated computer hardware and software could go far in raising the level of professionalism in the technical training environment. However, does the project deliver the necessary skills and the required knowledge to allow the learner to achieve these goals? Is the delivery method appropriate? Was the instructional goal achieved? Trainers can answer these questions and others through two powerful tools, summative and formative evaluation. It is important, though, that the user know the difference between the two.

A summative evaluation forms judgments about the merits of an already completed project. Here, strengths and weaknesses are summarized; a description is presented of how well the instructional goal was achieved. A result of a summative evaluation may be that the program worked or may have worked, but only under certain conditions (such as equipment availability or proper time allotment). This type of evaluation may also determine that a specified delivery method worked well within a specified environment. Note that summative evaluation differs from formative evaluation in that:

Formative evaluation:

- tends to provide suggestions toward improvement of a program while it is being modified or "formed"
- is more concerned with judgments made during the design and development stages that are used to improve the program's usefulness
- is used when a teacher modifies a program based upon information gained from previous lessons

Whereas summative evaluation:

- describes the merits of a program already completed
- informs the consumer whether a particular method works and under which conditions (Nitko 1983)

Formative Evaluation

As described, formative evaluation refers to a process whereby an evaluator makes judgments in order to improve or upgrade a training program. According to Dick and Carey (1985), three methods are available:

- One-on-one trials
- Small group trials
- Pilot test

The first two strategies use learners representative of the target population. The third measures the abilities of the program via actual implementation in the field. The designer used the one-on-one method as computer-based delivery allowed for an instructor/learner ratio of 1 to 1.

One-on-One Trials

The first implementation of the project was provided to a single learner who subsequently provided the initial formative evaluation data. Following this initial delivery, the project was provided to three and then two more learners. In each case, information was collected and evaluated to make formative evaluations and institute changes as these evaluations called for. Formative evaluation data was collected via two methods:

- Written questionnaire
- Oral questioning (and note-taking) by the course facilitator during the implementation stage

Note that the questionnaire was also used in making a summative evaluation and is provided in Appendix F.

Oral questioning techniques were used by the facilitator while monitoring the first learner's progress. Notes were taken and compared to responses from similar questioning during subsequent course deliveries. In this fashion the designer was able to measure the immediate effects of modifications made in response to problems noted. Problems encountered included:

- Loading DOS
- Accessing instructor
- Insufficient familiarity with AutoCAD
- Insufficient familiarity with WordPerfect
- Accessing laser printer

The problems were noted, corrections were made, and subsequent questioning was performed to measure the effectiveness of the

modifications. Table 2 summarizes this component of the formative evaluation.

Table 2 Problems and Solutions During Implementation

Problems Noted	Modification Made	Subsequent Effect
Student needed DOS disk	Command.com file added to student disk	DOS disk no longer needed
Difficulty in accessing course facilitator	Instructor name and phone #	Still some difficulty due to work schedule
Insufficient familiarity with AutoCAD	Instructor guide changed to allow and point out the need for tutoring	Efficiency better due to instructor being prepared
Insufficient familiarity with WordPerfect	Instructor guide changed to allow and point out the need for tutoring	Efficiency better due to instructor being prepared
Difficulty in accessing laser printer	Instructor printed documents from student project disk	Medium success, still too much delay

Note that the third and fourth problems, lack of software familiarity, seem to be the result of failure to meet entry requirements. However, to attempt to adequately measure this ability prior to allowing entrance into the training would be excessively time-consuming, not always successful and probably not in the best interest of the organization.

Rather, the designer sought to overcome minor difficulties of this nature as they arose. This required some extra input (and

ability) on the part of the course facilitator but seemed to be the best solution with the best organizational results. In any learning environment, instructors must be prepared to answer questions relating to, and supportive of, the particular subject being taught. Providing limited software tutoring, then, should not be considered an unreasonable demand on the facilitator.

Small Group Trials

The designer's project did not utilize small group trials. As the project's audience is quite limited in size, particularly that audience immediately available to the designer, small group trials were not appropriate. This type of trial is more useful when a large target audience exists; the course is then implemented to a representative sample that has been brought together. Observations made during the learning activity, then, are used to forge a formative evaluation.

Pilot Test

Pilot tests are most often best suited when a course is provided in one location as a test run for implementations at various other locations. Again, audience size in this case did not warrant such a test. It is generally accepted that pilot test refers to implementations provided to classes larger than just one or two students (else one-on-one trials would be pilot tests).

Summative Evaluation

The designer sought to construct a summative evaluation of the project, thereby identifying the effectiveness of the delivery method selected. Consideration would be given to the particular learning environment and target audience. Note that the prime learning activity took place via computer-based training. It was this particular method, then, that the designer intended to judge via summative evaluation.

Foremost among various indicators was the determination of whether or not the instructional goal had been met. In addition, learner opinions regarding the particular delivery method would be measured and evaluated.

Kirkpatrick (1987) identified four steps under which summative measurements can be made. These are:

- Reaction
- Learning
- Behavior
- Results impact

Reaction

The designer used questionnaires and instructional goal measurement as determinants within these four groupings. Questions were designed to measure the learner's opinions with regard to:

- Activities usefulness
- Activities accuracy
- Delivery's appropriateness

Results of the questionnaires, as provided by the five learners following the initial one-on-one trial, are provided in table 3 below.

Table 3 **Results of Student Feedback Questionnaires**

	Found Program Enjoyable	Considered Activity Useful	Considered Activity Accurate	Considered Delivery Appropriate
Completely	5	3	5	3
Mostly		2		2
Barely Acceptable				
Some Major Flaws				
Not Acceptable				

Reaction, according to Kirkpatrick, deals with how well trainees liked a particular training program. In this sense, measuring reaction is similar to measuring feelings about an experience. In fact, in today's industrial training environment, this is often considered "customer satisfaction." This reaction measurement is an important first step in evaluating a program. Learners who enjoy a training experience are apt to gain more

from the training. However, successful reaction responses are only the beginning; they do not indicate if learning took place, if future behavior will be changed or if the organization will realize any direct results from the training approach. The designer measured this component by simply asking the learners if they enjoyed the learning activity. As indicated by table 3, the learners did find the activity enjoyable.

Learning

Kirkpatrick defines learning as:

> "attitudes that were changed, and knowledge and skills that were learned"

He goes on to present guidelines for measuring learning that includes such items as using control groups, where practical, and analyzing the results statistically so that learning can be proved upon some mathematical basis. As the designer's project involves the teaching of skills, a performance measurement mode of measuring learning was selected. Thus, the students demonstrate their learning by creating the student project, a text and graphics training aid. Learning did take place in this project as indicated by the fact that all learners successfully attained the instructional goal. Success was indicated by exceeding minimum requirements set by evaluation measurement checklist, provided in Appendix F. Specific results of this checklist, as used to evaluate student performance in completing their projects, are provided in Table 4 below. Each criteria was

rated from 1 (very poor) to 5 (super). Some of the criteria, such as proper alignment of text and graphics, could be judged only as acceptable or unacceptable as there was no room for marginal performance. Thus, the evaluation checklist was modified so that these criteria could receive one of only two grades. Any score of 2 or less or an average below 4 was considered unacceptable.

Table 4 **Results of Student Project Evaluations**

	super	good	fair	poor	very poor
1. Text lines are readable.	5				
2. Text lines are parallel and horizontal with bottom of page.	5				
3. Graphics image is clear.	5				
4. Graphics image properly oriented on page.	5				
5. Project was completed within eight hours.	5				

This table illustrates the high success rate among the five learners in the program after the initial one-on-one trial.

Note that once learners became familiar with interfacing the software packages, high quality projects were nearly automatic. The hardware and software components involved merely output

products in response to inputs from the user. The opportunity to make mistakes becomes very small, thus the success rate becomes very high. A copy of one student project is included in Appendix F.

Behavior

It is one thing to gain an understanding of equipment operation or to acquire skills at a particular task, and it is quite another to use the skill and knowledge on the job several months or weeks later. If a training center accomplish such a goal with its learners, it could consider itself an unqualified success. Yet, how can these behavior changes be measured? At LILCO a system has been designed that attempts just that. Several months after the training takes place, questionnaires are sent out to the trainee's foreman. The supervisor has the trainee fill out part of the form and then the supervisor fills out the rest. Questions are designed to determine if the skills or knowledge gained have been applied to the job. As of the writing of this document, insufficient time has elapsed to perform this measurement.

Results/Impact

Most industrial organizations involved in training their employees seek bottom-line indications that the training efforts are worthwhile. They look for these indicators as any one of the following:

- reduced turnover
- reduced costs
- improved efficiency
- other factors that contribute to dollars saved

Evaluation of training program results is considerably difficult although in many cases specific objectives make it easier to accomplish. Examples would include reduced accidents and reduction of costs.

In the designer's program, the intended result is increased professionalism in the classroom resulting from higher quality training aids. It is this impact that the designer first had in mind when designing and developing the project. Due to time and money constraints, measurement of this result was not possible for this particular project. However, measurement might be feasible via independent ratings of instructional materials and related course evaluations.

Learning Transfer

One primary responsibility of any training organization deals with enhancing the transfer of learning in the learning environment to performance on the job. There are various strategies managers can employ in this effort, some prior to, some during, and others after the training event. At LILCO, emphasis is placed upon performance-based training, providing some enhancement of this transfer through thorough job simulation. For this project, the designer relied mainly upon

the cultivation of learner enthusiasm to boost learning transfer.

Broad (1980) has compiled an extensive list of actions to be taken by learners, trainers, and managers during each of the three phases listed above. The designer selected several of these that apply specifically to this project. They are summarized in table five.

Table 5

ACTIONS TO ENHANCE LEARNING TRANSFER

	BEFORE	DURING	AFTER
LEARNER	Confer with previous trainees	Write plan for using skills on the job	Review course materials
TRAINER	Get organ'l support for program	Incorporate real work projects	Develop an advanced course
MANAGER	Provide good facilities	Set realistic job performance goals	Publicize successful transfer of learning

This table provides methods by which transfer of learning can be enhanced throughout the leaner's time with the organization.

Summary

Evaluation of a training program can present to course designers the ultimate measure of their success when such an evaluation is performed in the proper fashion. Each stage must be organized well and implemented objectively. Evaluation falls into one of two major classifications: summative or formative. Summative indicates if a program and its delivery method were successful; formative is a tool used to upgrade a course.

Formative evaluation, in the shape of oral questioning, was employed to improve the course delivery between implementations. Several problems were noted and corrected, resulting in improved, subsequent delivery of the course. One problem, limited access to laser printers, was not alleviated.

The designer used summative evaluation to determine if the computer-based training delivery method was appropriate in providing training in AutoCAD and WordPerfect. Indications were that the delivery system was appropriate in that instructional goals were met, thereby satisfying Kirkpatrick's learning criterion. In addition, reaction was measured via questionnaire. Behavior change is to be measured in the future (once time allows) using LILCO procedures; results have not formally been measured.

CHAPTER 7

SUMMARY AND RECOMMENDATIONS

Introduction

At last, analysis, design, development, implementation, and evaluation were complete. Learners produced high quality training aids; in this they found they could boost the level of professionalism in their classrooms. Now came the time to take a giant step back and view the entire process. What tools brought the designer this far? It should not be assumed that the five-stage procedure used herein is valid for all training programs, particularly those employing new approaches such as computer-based training deliveries. Are there conclusions to be made about the ability of these tools to etch out a training program? Finally, what recommendations can the designer make to other trainers about to create or implement the same or similar programs?

Methods and Procedures Used

This project was created using the methodology provided by the Interservice Model of Instructional Systems Design. This method is further defined by INPO, who in turn provides direction to LILCO regarding this process of analysis, design, development, implementation, and evaluation. The designer followed LILCO training procedures, as much as possible for this project.

Analysis

A problem existed in the technical training environment, requiring the production of exceptional quality training aids. The designer analyzed this problem and determined that the best solution was a training program. The material developer's job was then analyzed to identify the specific tasks required to create the training aids. At this point, an instructional goal was formulated. This goal essentially included creating high quality text-and-graphics student handouts. AutoCAD and WordPerfect were selected by the designer as an excellent method for creating high quality training aids. The designer now had the proper input data to design a program.

Design

With the instructional goal in hand the designer proceeded with detailed task analysis. Resulting from this was a list of specific objectives to be achieved in the training program. The objectives were essentially the skills needed to co-ordinate the two software programs, AutoCAD and WordPerfect.

It was also determined that the course would be delivered via computer-based training. The Summit Authoring System was chosen for this task.

Given the instructional goal, the designer elected to measure learner achievement by judging students' creation of actual training aids. An evaluation checklist was used to ensure objectivity in judging.

An attempt was made to locate similar material via electronic bulletin board and ERIC search from the NYIT library. No training material was found that provided the specific instruction on AutoCAD and WordPerfect that the designer's program would provide.

Development

The designer set a schedule for the development of the various components of the project. A Gantt chart was established to organize and monitor progress. The instructional material to be developed included instructor guide, student guide, Summit disk, evaluation checklist and feedback questionnaire. The only significant deviation from schedule, one of about two weeks, resulted from a Summit software error, corrected soon after it was properly identified.

Each component was developed using guidelines set forth by LILCO procedures. An exception to this was the student Summit disk as no procedures were written to deal with computer-based training. Care was taken to expose the student to the conditions and criteria of the instructional goal as frequently as possible. This was considered necessary because the central learning activity was provided by computer; the instructor was more facilitator than teacher. In addition to those components necessary to deliver the course material, a questionnaire was developed to provide data for the formative evaluation.

Implementation

The designer approached implementation having two goals in mind: first, that the Summit delivery method would generate a spirited learner enthusiasm and second, that the learners would see the great gains to be made in the classroom through the use of more professional training aids. Feedback, via a written, end-of-course questionnaire, seemed to indicate that both of these goals were realized.

Sufficient course materials were reproduced to allow one instructor to deliver the course first to one student, then to three more, and finally to two more. Formative evaluation provided for improvement of some of the materials between deliveries.

Course delivery was accomplished essentially on a one-on-one basis. There was little interaction between students, mainly due to the work schedules involved. Some interaction occurred between student and facilitator during the course. This interaction was not originally expected with individual instruction. The learners developed a final project that was printed and evaluated by the course facilitator.

Data was assembled via two methods. Whether or not the student achieved the instructional goal was determined by evaluating the student project with the evaluation checklist. Secondly, information was collected with a questionnaire. These two sources of data, then, were combined in an effort to perform summative and formative evaluations.

Evaluation

Formative evaluation was performed in order to identify improvements in the project prior to subsequent course deliveries. Improvements made include the following:

- Command.com file added to student disk
- Instructor name and phone # added to student guide
- Instructor guide modified
- Instructor performed actual printing operations

Summative evaluation was performed to determine if the delivery method was appropriate for the given conditions. This was accomplished via questionnaire. Learner response was generally favorable in this regard.

The training program's affect on the learner was investigated based upon Kirkpatrick's three steps, learning, behavior change, and results/impact. Two sources of data provided information toward these measures: results of students meeting instructional goals and questionnaires. Future behavior change was not yet measured.

Conclusions

Two aspects of this project were of significant importance and warrant special attention. One involves content, the other context. These are:

- training instructors to use powerful software
- using computer-based-training

The designer provided training in the creation of quality

training aids using AutoCAD and WordPerfect. Instructors (as learners) overcame any intimidation resulting from the intricate powers of the programs and met or surpassed the instructional goal.

Recommendations

The designer's first recommendation deals with target audience. As this project provides instructors with a method for raising their level of instruction significantly above minimum standards, its implementation deserves special consideration.

Trainers responsible for the training of fellow instructors must be aware of what motivates the instructors they train. In most cases, the decision to provide training aids of low, medium, or high quality rests solely upon the individual instructor's shoulders. The designer has found that many training organizations do not provide this motivation, due either to ignorance or to an attempt to save money. It was the designer's good fortune to deal with learners who had the proper self-motivation. A recommendation, then, is to select learners with high personal standards or who belong to an organization that takes seriously its obligation to provide high quality training.

A second recommendation stems from the experience gained by the delivery of this project and deals with computer-based-training delivery. Trainers who use computers in their work easily lose sight of the fact that others are often intimidated by the ability of the micro-chip. Typically, as the powers of

programs grow, their degrees of difficulty expand geometrically. Thus, CBT operations must be kept simple. Quality, on-screen graphics, combined with easily understood menus, will help keep the learner encouraged and confident.

Concluding Statement

Computers are a great tool for trainers. They are fast and powerful. They are capable of turning out exacting graphics as well as countless fonts of text. The opportunity for trainers to raise the level of professionalism in their classrooms via high quality training aids has never been so great. As the technical demands on those we train are increased ever more, instructors must meet this challenge with new enthusiasm. Obviously, we must first train the trainers.

Providing training in the specific use of powerful computer software is a task the instructor training trade must undertake. One excellent method seems to be computer-based training. It provides detailed training at a pace set by the user and flexible around long or odd working hours. The very use of CBT helps the trainer/learner overcome computer intimidation.

Computers are here to stay. The best trainers will embrace these powerful new tools with persistence and great expectations. It is the responsibility of instructor trainers to provide the skills and knowledge requirements needed by those they train to excel in their fields.

APPENDIX A

EXPERIMENT FOR DETERMINING TIME SAVED BY TRAINING PROJECT

Appendix A

Experiment for Determining Time Saved by Training Project

During 1988, the designer developed a course entitled Process Control. A lesson within the course is Pneumatic Controllers. This specific lesson was taught twice in the same year, before and after significant upgrades were made to the course material.

The course is technically oriented and relies heavily upon hands on experience as well as graphical training aids. The designer originally developed most of the training aids using scissors, tape, typewriter, and copy machine (case 1). Later, during course revision, the designer created new training aids using the principles outlined in this project (case 2). Examples of each are summarized below.

Objective: Develop a three page handout that, via text and graphics, describes in detail the operation of a Foxboro 43AP pneumatic controller.

Case #1

Copying schematics and pictures from technical manuals and combining these images with text from technical manuals and company procedures, it required two days to produce the student handout. Graphics quality was mediocre to poor, and at times unusable. Text was readable, but sometimes uneven with respect to other text and graphics.

Time: 16 hours

Quality: Medium to poor

Case #2

As outlined in this project, diagrams of the controller were created to engineering standards using AutoCAD. Text was created with WordPerfect and the two were combined using the word processor's interactive capabilities. The final product was printed out on a laser printer after approximately eight hours work. The graphics quality ,as well as the text quality was excellent.

Time: 8 hours

Quality: Excellent

Though not directly measurable, training effectiveness was apparently improved as students had no difficulty reading text or making out details in case #2. In fact, trainees commented on the unusual professionalism displayed by the student handouts.

APPENDIX B

COMPLETE AND SELECTED TASK LISTS

Appendix B

Complete and Selected Task Lists

Complete Task List

1. Identify technical student training aid needs.
2. Identify sources of technical information for inclusion in training aids.
3. Obtain appropriate graphical representations.
4. Create graphical representations.
5. Obtain text for use with training aids.
6. Write text for use with training aids.
7. Assemble training aid.
8. Distribute training aid at appropriate times in training program.

Selected Task List

1. Obtain appropriate graphical representations.
2. Create graphical representations.
3. Assemble training aid.
4. Obtain/write text for training aid.

APPENDIX C

TASK WORKSHEETS

Appendix C

Task Worksheets

Task #1: Obtain computer file containing appropriate graphical representations, in a form suitable for use by WordPerfect.

Safety precautions: None

Step 1: Locate appropriate drawing file in AutoCAD program.

Step 2: Plot drawing file to plot file.

Step 3: Convert plot file to WordPerfect graphics file.

Skills and Knowledge:

1. Startup AutoCAD program.
2. Identify drawing files.
3. Plot files.
4. Exit AutoCAD program.
5. Implement WordPerfect graphics conversion program.
6. Create WordPerfect graphics box.

Task #2: Assemble training aid.

Safety precautions: none

Step #1: Enter Wordperfect word processor.

Step #2: Load appropriate text file.

Step #3: Create graphics box.

Skills and Knowledge:

1. Startup WordPerfect program.
2. Identify text files.
3. Load text files.
4. Create graphics box.
5. Output file to laser printer.
6. Implement WordPerfect graphics conversion program.
7. Create WordPerfect graphics box.

APPENDIX D

SKILLS AND KNOWLEDGE AND ENABLING OBJECTIVES AND OBJECTIVE SEQUENCING

Appendix D

Skills and Knowledge

1. Using AutoCAD, the student must be able to:
   ...startup program
   ...identify drawing files
   ...plot files
   ...exit program

2. Implement WordPerfect graphics conversion program.

3. Using WordPerfect, the student must be able to:
   ...startup program
   ...identify text files
   ...load text files
   ...create graphics box
   ...output file to laser printer

Enabling Objectives

1. Describe how to access an AutoCAD drawing file.

2. Describe how to convert an AutoCAD drawing to a plot file.

3. Describe how to convert an AutoCAD plot file to a WordPerfect graphics file.

4. Describe how to access a WordPerfect text file.

5. Describe how to create a WordPerfect graphics file.

6. Describe how to output a WordPerfect file to a laser printer.

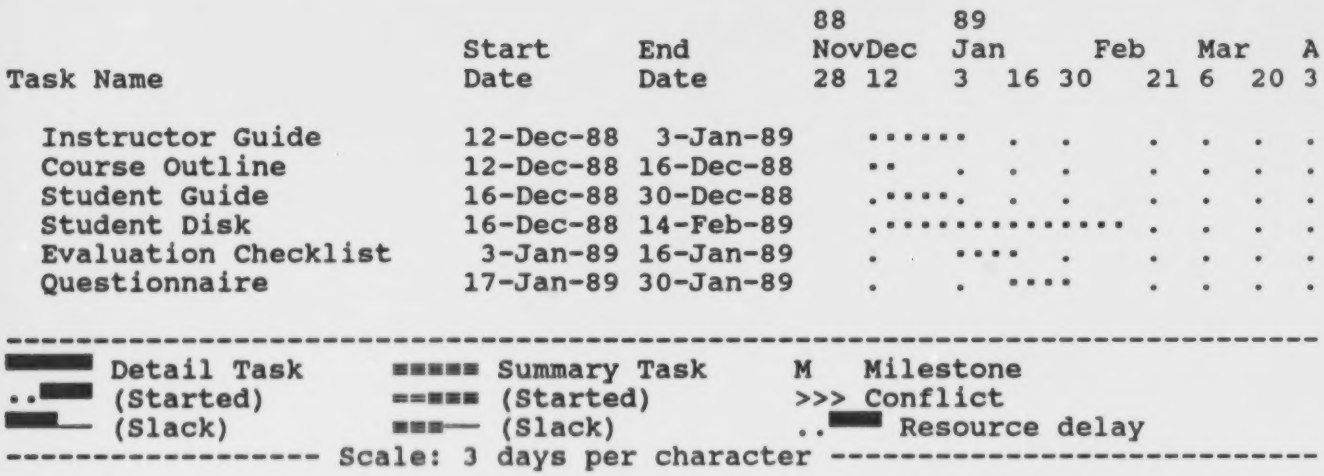
Sequencing of Enabling Objectives

Enabling objectives are all covered in the same learning activity, the Summit disk. Within that activity, they are presented in the order that they are used. This is the same order as listed above.

APPENDIX E

PERT AND GANTT TIME SCHEDULING CHARTS

Responsible : Dave Paquin
As-of Date : 30-May-89 8:00am Schedule File : C:\TL3\DATA\DAVE1



TIME LINE Gantt Chart Report, Strip 1

PERT CHART

L1LCO TECHNICAL INSTRUCTOR TRAINING PROGRAM

START

NEEDS, JOB, AND TASK ANALYSIS
11/88

SURVEY EXISTING MATERIAL
11/88

DESIGN PROGRAM
12/88

DEVELOP COURSE OUTLINE
12/88

DEVELOP STUDENT DISK
1/89

DEVELOP GUIDES
1/89

DEVELOP EVALUATION CHECKLIST
2/89

ONE ON ONE TRIAL
3/89

REVISE MATERIAL
3/89

IMPLEMENT ONE ON ONE PROGRAM
4/89

EVALUATE RESULTS
4/89

END
4/89

APPENDIX F

COURSE DELIVERY DOCUMENTS

Appendix F

Course Delivery Documents

Contents:

1. Instructor Guide.....F-1

2. Student Guide.....F-3

3. Evaluation Guideline.....F-5

4. Questionnaire.....F-6

5. Printout of Summit Student Disk....F-7

6. Example Completed Student Project..F-8

7. Course Outline.....F-9

INSTRUCTOR GUIDE

LEARNING OBJECTIVE:

Given an IBM compatible computer, laser printer, technical subject matter information, AutoCAD Version 9.0 and WordPerfect 5.0, produce a student handout combining graphics and text. There will be no spelling errors, no uneven text lines, no unreadable text, and the handout will include an informative graphics image free from distortion. The project shall be completed within one eight hour day.

PROCEDURE:

1. Introduce self and discuss purpose of program.
2. Give student the following:
   a. Student guide
   b. Summit student disk
3. Read student guide with student and discuss course goals including time and quality requirements.
   a. Emphasize that the purpose of this learning experience is to be able to provide high quality training aids.
4. When student informs you they are ready to create student project, give them drawing and text files on disk. Note and record time as students are allowed just eight hours to complete training aid according to learning objective.

F-1

a. Prior to allowing student to begin project, review learning objective with student.

5. As course projects are completed, evaluate with project evaluation guideline. Discuss with learner other possible uses of the skills gained in this course.
6. Review learning objective with student, ensuring all facets of objective are met.
7. Upon completion of course, have students complete course evaluation questionnaire.

NOTE:

This course is self-paced. Periodically check on learners' progress. Provide technical assistance as requested. Emphasize importance of quality work. Ensure no software problems inhibit student performance.

STUDENT GUIDE

LEARNING OBJECTIVE:

Given an IBM compatible computer, laser printer, technical subject matter information, AutoCAD 9.0 and WordPerfect 5.0, the student will produce a student handout combining graphics and text. There must be no spelling errors, no uneven text lines, no unreadable text, and the handout will include informative, distortion-free graphics. The project must be completed within one eight hour day.

MATERIALS:

1. Computer with laser printer
2. AutoCAD (at least version 9.0)
3. WordPerfect (at least version 5.0)
4. Student Summit disk
5. Student project text and graphics files disk (to be obtained at start of final project)

PROCEDURE:

1. Discuss learning objective with course facilitator.
2. Insert Summit disk in drive "A" and type "GO" and press RETURN.
3. Learn how to create training aid using information on

disk. Refer specific questions to course facilitator.

4. When ready to create project, obtain necessary files from course facilitator. Note that eight hours are allowed before completion of project.
5. Create handout.
6. Have course facilitator evaluate your project.

NOTES:

1. You may wish to copy the Summit student disk to your hard drive to provide future, ready reference to these procedures.
2. You can exit the program any time by pressing F10.
3. Contact the instructor at any time for questions.

EVALUATION CHECKLIST

INSTRUCTOR:_____ **DATE:**_____

STUDENT:_____

Instructions to Course Facilitator

Evaluate the learner's project for each of the following five criteria. Assign a number 1 through 5 for each evaluation, where 5 is super and 1 is very poor.

Any one "2", or an average below 4.0 is considered unacceptable towards course completion.

	super	good	fair	poor	very poor
1. Text lines are readable.	☐	☐	☐	☐	☐
2. Text lines are parallel and horizontal with bottom of page.	☐				☐
3. Graphics image is clear.	☐	☐	☐	☐	☐
4. Graphics image is properly oriented on page.	☐				☐
5. Project was completed within eight hours.	☐				☐

Lowest Score:_____ minimum is 3.0

Average Score:_____ minimum is 4.0

F-5

STUDENT END-OF-COURSE QUESTIONNAIRE

Please rate each of the following aspects by providing a number 1 to 5 that best describes your feelings about the program:

1 - Completely agree

2 - Mostly agree

3 - Agree only somewhat

4 - Mostly disagree

5 - Completely disagree

1. I found the learning activity useful. ___

2. I found the learning activity enjoyable. ___

3. The information contained in the program appeared to be accurate. ___

4. The course delivery method (computer-based -training) was appropriate. ___

5. The Summit student disk operated without problem. ___

6. The Summit student disk was easy to interact with. ___

7. Completing this training has improved my ability to make student handouts. ___

8. Creating quality student handouts can raise the level of professionalism in the classroom. ___

PRINTOUT OF SUMMIT STUDENT DISK

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

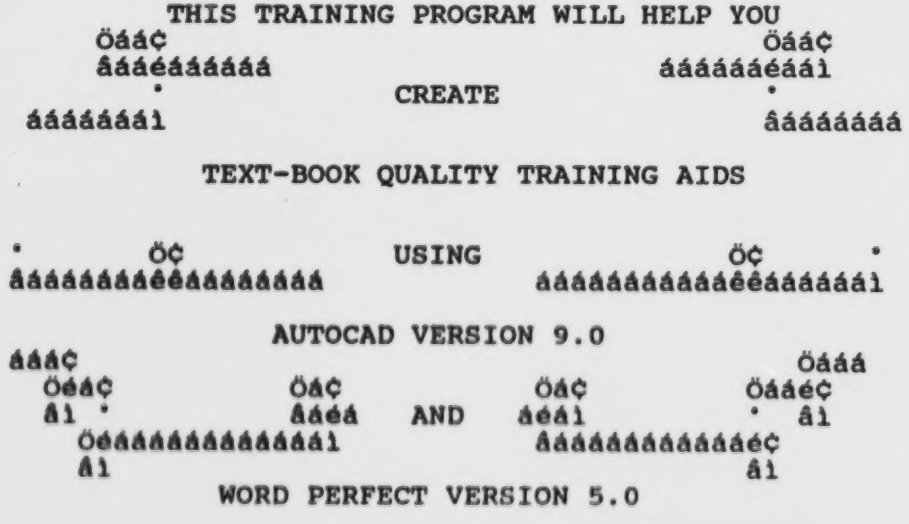
SCREEN: th0101 Library: 01

Last author ..... Paquin
Last edited 01-01-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 15
Last background color used ... 1
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 0
Collect CMI data ..... N

--- Screen Contents ---



```
--- Graphics and Final Branching ---

Special Option ..............
Pause ......................... Y
Character Set ..............
Graphics Underlay File .......
Text Preview Screen ..........
Back-up Screen ................ (p
Menu Screen ...................
Next Screen(s) ................ th0102
```

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

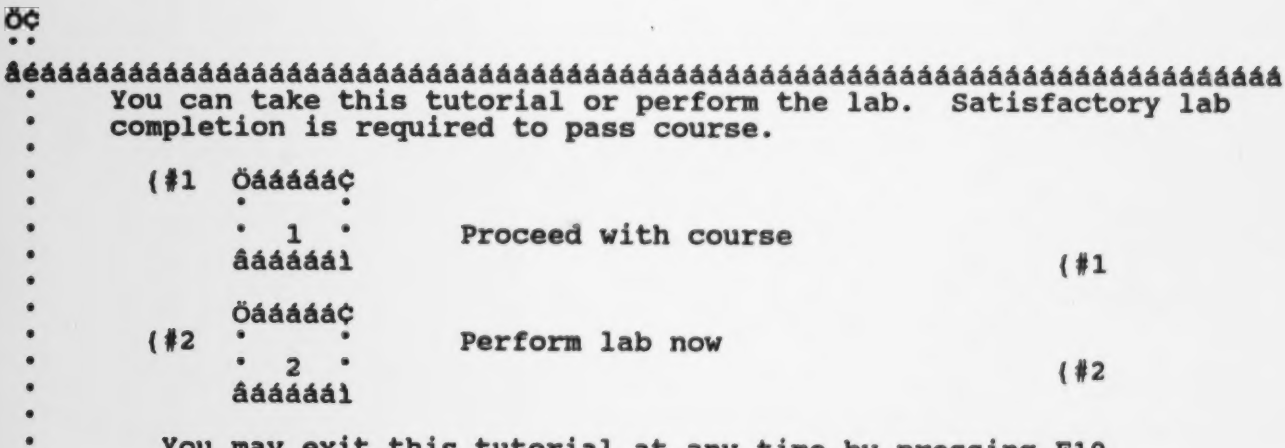
SCREEN: th0102 Library: 01

Last author ..... Paquin
Last edited 01-01-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 11
Last background color used ... 1
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 1
Collect CMI data ..... N

--- Screen Contents ---


You can take this tutorial or perform the lab. Satisfactory lab completion is required to pass course.
(#1
1
Proceed with course
(#1
(#2
2
Perform lab now
(#2
You may exit this tutorial at any time by pressing F10

Press <F3> to continue with the lesson.

```
--- Anticipated Answer Specifications ---

 1)  K49|T#1
 2)  K50|T#2

--- Question Presentation Parameters ---

   Chances  Show?  Order
#1    9       No      1

--- Question Blank Pre-Sets|Input Templates ---


--- Question Page Parameters ---
Page judging, #=redo ..... N
Maintain color at blank ..... N
Cursor up/down active ..... N
Sound effects ..... Y
Tab between fields ..... N
End of field continue ..... N
Allow blank input ..... N
Scrolling menu bar ..... N
Back-up key ..... -59
Menu key ..... -60
Next key ..... -61
Help key ..... -62
Comment key ..... -63
Quit key ..... -68
End field entry key ..... 13
End page entry key ..... 0

--- Hot Keys ---


--- Question Help Messages / Screens ---

 1)  Press the "1", or "2" key...
 2)  ...or point with the mouse...
 3)  ...and press a button...
 4)  ...or press <F3> to continue.

--- Feedback Messages / Screens ---


--- Branching and Calculations ---

 1)  (c1=1:|th0103  $$Outline
 2)  (c1=2:|th0601  $$Lab information
```

```
--- Graphics and Final Branching ---

Special Option ..............
Pause ....................... n
Character Set ...............
Graphics Underlay File .......
Text Preview Screen ..........
Back-up Screen ............... (p
Menu Screen ..................
Next Screen(s) ............... th0103
```

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0601 Library: 01

Last author ..... Paquin
Last edited 01-01-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 1
Last background color used ... 7
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 1
Collect CMI data ..... N

--- Screen Contents ---

LAB PERFORMANCE INFORMATION

1. Your completed lab will be evaluated by the instructor.

2. You will create a two page handout, with text and graphics on each page.

3. The graphics files will have been created on AutoCAD and saved as drawings and the text will be provided as a WordPerfect file.

4. You may arrange the text and graphics in any fashion you consider appropriate. The course facillitator will evaluate your final project according to the learning objective in the student guide.

5. Remember quality counts! The idea is to create an accurate, informative student handout that will add professionalism to your classroom.

6. Select: (#1 1 Create lab project now. (#1

(#2 2 Review selected course material. (#2

```
--- Anticipated Answer Specifications ---

 1)  K49|T#1
 2)  K50|T#2

--- Question Presentation Parameters ---

   Chances  Show?  Order
#1    9       No      1

--- Question Blank Pre-Sets|Input Templates ---


--- Question Page Parameters ---
Page judging, #=redo ..... N
Maintain color at blank ..... N
Cursor up/down active ..... N
Sound effects ..... Y
Tab between fields ..... N
End of field continue ..... N
Allow blank input ..... N
Scrolling menu bar ..... N
Back-up key ..... -59
Menu key ..... -60
Next key ..... -61
Help key ..... -62
Comment key ..... -63
Quit key ..... -68
End field entry key ..... 13
End page entry key ..... 0

--- Hot Keys ---


--- Question Help Messages / Screens ---

 1)  Press the "1" or "2" keys...
 2)  ...or point with a mouse...
 3)  ...and press a button...
 4)  ...or press<F3> to continue.

--- Feedback Messages / Screens ---


--- Branching and Calculations ---

 1)  (c1=1:|th0602
 2)  (c1=2:|th0104
```

```
--- Graphics and Final Branching ---

Special Option ..............
Pause ......................... n
Character Set ..............
Graphics Underlay File .......
Text Preview Screen ..........
Back-up Screen ................ (p
Menu Screen ..................
Next Screen(s) ................ th0602
```

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0201 Library: 01

Last author ..... Paquin
Last edited 01-04-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 15
Last background color used ... 1
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 0
Collect CMI data ..... N

--- Screen Contents ---

PART ONE

CONVERTING DRAWING TO PLOT FILE

STEPS:

1. Enter AutoCAD.
2. Select plot option.
3. Enter name of appropriate drawing; for this project names are project1 and project2.
4. Ensure "plot to file?" option is set to yes.
5. Plot drawing (to file).
6. A new file is created with same name only with the .plt extension.

```
--- Graphics and Final Branching ---

Special Option ..............
Pause ..................... Y
Character Set ..............
Graphics Underlay File .....
Text Preview Screen ........
Back-up Screen ............. (p
Menu Screen ................
Next Screen(s) ............. th0104
```

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0202 Library: 01

Last author ..... Paquin
Last edited 01-04-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 15
Last background color used ... 1
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 0
Collect CMI data ..... N

--- Screen Contents ---

PART TWO

CONVERTING PLOT FILE TO WORD PERFECT GRAPHICS FILE

STEPS:

1. At 'C' prompt, change directory to WP5.0 subdirectory (cd\wp5.0).
2. Enter command "graphconv".
3. At prompt for file name, enter AutoCAD plotted drawing name; be sure to include .PLT extension. Example: C:\ACAD\PROJECT1.PLT.
4. Follow prompts given by conversion program.
5. New file is created with same name and .WPG extension.

--- Graphics and Final Branching ---

Special Option .....
Pause .....
Character Set ..... Y
Graphics Underlay File .....
Text Preview Screen .....
Back-up Screen .....
Menu Screen ..... (p
Next Screen(s) th0104

```
Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0104          Library: 01

Last author ..................... Paquin
Last edited ..................... 01-04-1987

--- Screen Attributes ---

Screen code ..................... 0
Screen mode ..................... 0
Last foreground color used ... 11
Last background color used ... 1
Border/palette color ......... 1
Window top line ............... 1
Window left column ............ 1
Window bottom line ............ 23
Window right column ........... 80
Screen width (columns) ........ 80
Screen height (lines) ......... 23
Number of questions ........... 1
Collect CMI data .............. N

--- Screen Contents ---

    Select individual part for instruction:          ÖÇ     ÖÇ
                                                    ááéì    ··
                                                      âáááááéì
                                                     ·   ÖÇ
            PART              INSTRUCTION ABOUT      âááéì
           áááá                áááááááááááááááá        âáá
         Öáááá Ç
    (#1  ·    ·
         ·  1 ·          Plotting AutoCAD File
         âáááá ì                                          (#1
         Öáááá Ç
    (#2  ·    ·          Converting Plot File to WP Graphics
         ·  2 ·                                           (#2
         âáááá ì
         Öáááá Ç
    (#3  ·    ·          Combining Graphics With Text
         ·  3 ·                                           (#3
         âáááá ì
         Öáááá Ç
    (#4  ·    ·          Printing File With Laser Printer
         ·  4 ·                                           (#4
         âáááá ì

        OR PRESS <F3> TO GET LAB PERFORMANCE INFORMATION.
```

```
--- Anticipated Answer Specifications ---

 1)  K49|T#1
 2)  K50|T#2
 3)  K51|T#3
 4)  K52|T#4

--- Question Presentation Parameters ---

   Chances  Show?  Order
#1    9       No      1

--- Question Blank Pre-Sets|Input Templates ---


--- Question Page Parameters ---
Page judging, #=redo ..... N
Maintain color at blank ..... N
Cursor up/down active ..... N
Sound effects ..... Y
Tab between fields ..... N
End of field continue ..... N
Allow blank input ..... N
Scrolling menu bar ..... N
Back-up key ..... -59
Menu key ..... -60
Next key ..... -61
Help key ..... -62
Comment key ..... -63
Quit key ..... -68
End field entry key ..... 13
End page entry key ..... 0

--- Hot Keys ---


--- Question Help Messages / Screens ---

 1)  Press the 1, 2, 3, or 4 key...
 2)  ...or point with the mouse...
 3)  ...and press a button...
 4)  ...or press <F3> to continue.

--- Feedback Messages / Screens ---


--- Branching and Calculations ---
```

```
 1)  (c1=1:|th0201  $$Part One
 2)  (c1=2:|th0202  $$Part Two
 3)  (c1=3:|th0203  $$Part Three
 4)  (c1=4:|th0204  $$Part Four

--- Graphics and Final Branching ---

Special Option ..............
Pause ......................... n
Character Set ..............
Graphics Underlay File .......
Text Preview Screen ..........
Back-up Screen ................ (p
Menu Screen ..................
Next Screen(s) ................ th0601
```

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0103 Library: 01

Last author ..... Paquin
Last edited 01-04-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 15
Last background color used ... 1
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 0
Collect CMI data ..... N

--- Screen Contents ---

OUTLINE FOR CREATING TRAINING AID

This is an outline for creating your student handout:

1. Access AutoCAD drawing.
2. Plot this drawing to a file using the AutoCAD plot feature.
3. Exit AutoCAD and convert the plotted file to a WordPerfect graphics file.
4. Enter WordPerfect and access the appropriate text file.
5. Use the graphics function to place the graphics into your text.
6. Setup WordPerfect file for printing with laser printer.
7. Print file.

PRESS F3 TO SEE OPTIONS

--- Graphics and Final Branching ---

Special Option .....
Pause ..... Y
Character Set .....
Graphics Underlay File .....
Text Preview Screen .....
Back-up Screen ..... (p
Menu Screen .....
Next Screen(s) th0104

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0203 Library: 01

Last author ..... Paquin
Last edited 01-04-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 15
Last background color used ... 1
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 0
Collect CMI data ..... N

--- Screen Contents ---

PART THREE - COMBINING GRAPHICS WITH TEXT

STEPS:

1. Enter WordPerfect and retrieve text file. For this project, text files are named TEST1 and TEST2.

2. Place cursor at desired location of text.

3. Press Alt-F9 and set desired graphics characteristics.

4. Press '1' and enter graphics file name with .WPG extension.

5. Make appropriate selection and enter caption, if desired.

6. Return to document, press Shift F7 and view document.

7. Use Alt-F9 functions to place graphics horizontally and vertically as desired.

8. Press F7 and save file. WPG and PLT files may be deleted to conserve memory.

```
--- Graphics and Final Branching ---

Special Option ..............
Pause ......................... Y
Character Set ..............
Graphics Underlay File .......
Text Preview Screen ..........
Back-up Screen ................ (p
Menu Screen ..................
Next Screen(s) ................ th0104
```

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0204 Library: 01

Last author ..... Paquin
Last edited 01-04-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 15
Last background color used ... 1
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 0
Collect CMI data ..... N

--- Screen Contents ---

PART FOUR - PRINTING YOUR PROJECT WITH A LASER PRINTER

STEPS:

1. Enter WordPerfect and retrieve document with combined graphics and text.

2. Press Shift-F7.

3. Select "Select Printer" option.

4. Select "HP LaserJet Series 2" printer.

5. Go to "Printer Control" screen (by pressing return) and set graphics and text to high quality.

6. Check that Printer is connected and is on-line.

7. At "Printer Control" screen, select "Full Document". Printer should print document. Note that graphics will cause printer to be somewhat slow; the initial print may take up to 15 minutes.

```
--- Graphics and Final Branching ---

Special Option ..............
Pause ......................... Y
Character Set ..............
Graphics Underlay File .......
Text Preview Screen ..........
Back-up Screen ................ (p
Menu Screen ..................
Next Screen(s) ................ th0104
```

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0602 Library: 01

Last author ..... Paquin
Last edited 01-01-1987

--- Screen Attributes ---

Screen code 0
Screen mode 0
Last foreground color used ... 15
Last background color used ... 1
Border/palette color 1
Window top line 1
Window left column 1
Window bottom line 23
Window right column 80
Screen width (columns) 80
Screen height (lines) 23
Number of questions 0
Collect CMI data ..... N

--- Screen Contents ---

LAB PERFORMANCE

1. Create page 1 as follows:

   a. Use drawing 721.dwg, located in a subdirectory on the floppy disk designated ACAD.

   b. Combine it with page one of text, which is file 721.txt, in the subdirectory designated WP50.

   c. Document layout can be viewed using the "view" feature of WordPerfect prior to printout. See course facillitator for details. Document should appear as called for by learning objective.

PROFESSIONALISM COUNTS ! ! ! !

```
--- Graphics and Final Branching ---

Special Option ..............
Pause ......................... Y
Character Set ..............
Graphics Underlay File .......
Text Preview Screen ..........
Back-up Screen ................ (p
Menu Screen ..................
Next Screen(s) ................ th0604
```

```
Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: th0604          Library: 01

Last author ..................... Paquin
Last edited ..................... 01-01-1987

--- Screen Attributes ---

Screen code ..................... 0
Screen mode ..................... 0
Last foreground color used ... 15
Last background color used ... 1
Border/palette color ......... 1
Window top line ..............  1
Window left column ...........  1
Window bottom line ........... 23
Window right column ..........  80
Screen width (columns) .......  80
Screen height (lines) ........  23
Number of questions ..........  0
Collect CMI data .............  N

--- Screen Contents ---

ÖÇ                                                                    ÖÇ
ÅéÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁ   LAB PERFORMANCE CONTINUED   ÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁéÌ
  .                                                                    .

   2.  Create page 2 as follows:

       a.  Use drawing file 720.dwg, located in subdirectory containing

           ACAD.

       b.  Combine with page 2 of text, which is the file 720.txt in the
           WP50 subdirectory.

       c.  This page will combine with page 1 to create your training
           aid.

   3.  Upon completion, give project to course facillitator.  It will
       then be evaluated according to the learning objective.

                       GOOD  LUCK ! !
.                                                                       .
ÓéÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁÁ
```

--- Graphics and Final Branching ---

Special Option .....
Pause ..... Y
Character Set .....
Graphics Underlay File .....
Text Preview Screen .....
Back-up Screen ..... (p
Menu Screen .....
Next Screen(s) th0604a

```
Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: @start          Library: 01

Last author ..................... Paquin
Last edited ..................... 01-01-1987

--- Screen Attributes ---

Screen code ..................... 0
Screen mode ..................... 3
Last foreground color used ... 10
Last background color used ... 1
Border/palette color ......... 4
Window top line ..............  1
Window left column ...........  1
Window bottom line ...........  9
Window right column ..........  80
Screen width (columns) .......  9
Screen height (lines) ........  25
Number of questions ..........  0
Collect CMI data .............  N

--- Screen Contents ---


          COMBINING TEXT AND GRAPHICS....


                                .....MAKES SUPER HANDOUTS!

                      press RETURN to continue

--- Graphics and Final Branching ---

Special Option ..............
Pause ........................ Y
Character Set ...............
Graphics Underlay File ....... tgraph3
Text Preview Screen ..........
Back-up Screen ............... (p
Menu Screen ..................
Next Screen(s) ............... th0101
```

Summit Authoring System -- Lesson Screen Print -- 01-01-1987

SCREEN: @start Library: 01

Last author ..... Paquin
Last edited 01-01-1987

--- Screen Attributes ---

Screen code 0
Screen mode 3
Last foreground color used ... 10
Last background color used ... 1
Border/palette color 4
Window top line 1
Window left column 1
Window bottom line 9
Window right column 80
Screen width (columns) 9
Screen height (lines) 25
Number of questions 0
Collect CMI data ..... N

--- Screen Contents ---

SELECT: (#1 1 EXIT TUTORIAL (#1

(#2 2 REVIEW SELECTED MATERIAL (#2

HAVE A GREAT DAY!

-- Anticipated Answer Specifications ---

1) K49|T#1
2) K50|T#2

-- Question Presentation Parameters ---

	Chances	Show?	Order
1	9	No	1

```
--- Question Blank Pre-Sets|Input Templates ---


--- Question Page Parameters ---
Page judging, #=redo ..... N
Maintain color at blank ..... N
Cursor up/down active ..... N
Sound effects ..... Y
Tab between fields ..... N
End of field continue ..... N
Allow blank input ..... N
Scrolling menu bar ..... N
Back-up key ..... -59
Menu key ..... -60
Next key ..... -61
Help key ..... -62
Comment key ..... -63
Quit key ..... -68
End field entry key ..... 13
End page entry key ..... 0

--- Hot Keys ---


--- Question Help Messages / Screens ---

 1)  Press the "1" or "2" keys...
 2)  ...or point with a mouse...
 3)  ...and press a button...
 4)  ...or press<F3> to continue.

--- Feedback Messages / Screens ---


--- Branching and Calculations ---

 1)  (c1=1:|end
 2)  (c1=2:|th0104

--- Graphics and Final Branching ---

Special Option .....
Pause ..... n
Character Set .....
Graphics Underlay File ..... tgraph4
Text Preview Screen .....
Back-up Screen ..... (p
Menu Screen .....
```

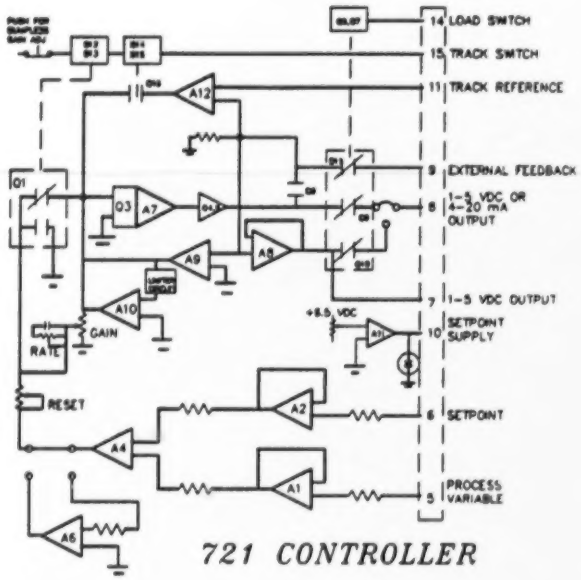
Next Screen(s) ..... end

Completed Student Projects

Bailey 721 Controller

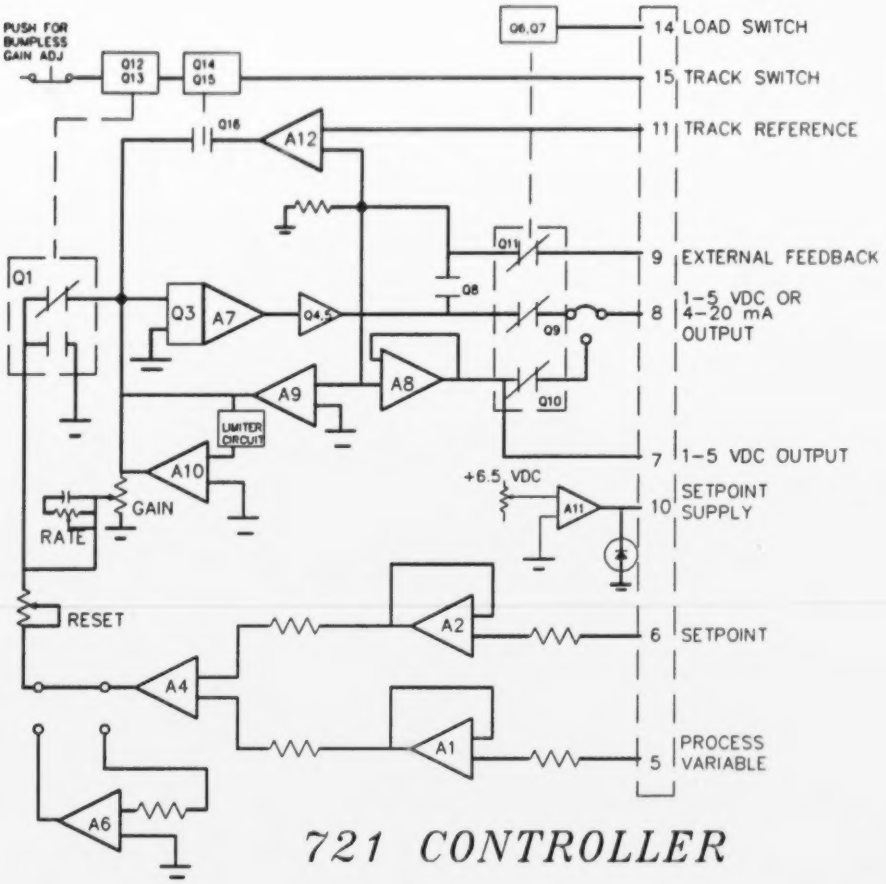
The Bailey 721 controller is the heart of the Bailey 7000 Control System. This card interacts with several other cards to provide the complete control of a selected process. The 721 performs its primary function when the system is in automatic. At this time it will sense the condition of the measured process and manipulate a final control element to restore the process to the desired setpoint.

Use your highlighter to follow the circuit as the instructor explains the operation of the 721. Particularly be aware of terminals and their functions. During a lab exercise, the students will interconnect four Bailey cards, including the 721, to control a process. It is important, then, to understand the function of each terminal connection on the card.



721 CONTROLLER

Other cards that will be included in the process lab exercise are the 720 Utility station, the 724 Logic unit and the 722 Manual unit. Each of these have individual functions, but depend on the 721 for proper operation. Note that the 720 provides status indication for the overall system.



721 CONTROLLER

This Bailey 721 controller contains the electronic circuitry that interconnects all other system components. As a Control Technician, your responsibilities include troubleshooting and repairing the 721. Other cards in the system include the Logic Unit, Manual Unit, and the Utility Station.

Circuit operation: Process variable is compared to setpoint. Resulting error signal is applied to amplifier circuit through reset and reversing circuit. Output of amplifier exits card as either a voltage or current signal depending on terminals used and jumper placement.

COURSE OUTLINE

Title: Creating Training Aids With AutoCAD and WordPerfect

Length: Variable, according to learner's entry level

Description: Learners will create training aids using the above -mentioned software and a laser printer

Media: Course is delivered via computer-based-training

Target Audience: Technical instructors at LILCO

Evaluation: Attainment of objectives is measured through use of evaluation checklist. Course facilitator evaluates student project.

APPENDIX G

RELATED LILCO PROCEDURES

Excerpts From
Related LILCO Procedures

Contents:

1. Conducting a Training Needs Analysis...OTP 2.01

2. Conducting Job Analysis.....OTP 2.02

3. Conducting Task Analysis.....OTP 2.03

4. Modification of Task Selected for Training List.....OTP 2.04

5. Establish Entry Level Skills and Knowledge.....OTP 3.03

6. Preparation, Review and Approval of Lesson Plans.....OTP 4.01

7. Evaluation of Training Program Effectiveness.....OTP 6.01

LILCO LONG ISLAND LIGHTING	OFFICE OF TRAINING PROCEDURES	OTP 2.01 REV. 1 Effective Date 6-30-88

TITLE: CONDUCTING A TRAINING NEEDS ANALYSIS

1.0 PURPOSE

This procedure provides the method by which the Office of Training shall interface, and provide guidance to LILCO Departments seeking assistance in solving company problems, through the application of the training function. It provides directions to conduct a needs analysis for the purpose of evaluating if a valid need to do training exists. In addition, it serves as the instrument to initiate and approve the application of the training function.

2.0 SCOPE

This procedure is used to request new training programs or major revisions of existing programs that would result in major expenditures of company resources in developing and implementing the training program.

3.0 DEFINITIONS

3.1 Training Function - The application of any number of delivery systems to help build skills and knowledge and evaluate results toward the betterment of the human resource. The application involves all aspects of the analysis, design, development, implementation, and evaluation of training programs.

3.2 Human Resource Needs - A deficiency or discrepancy in employee competency that exhibits itself as a performance skill of either psychomotor or cognitive nature. A vacancy for an established or projected position (job) also surfaces as a human resource need.

3.3 Psychomotor - Refers to motor action directly proceeding from mental activity. Examples include welding, re-packing a valve, and operating a feed water controller.

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APPROVED BY/DATE J. R. Smith 4/5/88

3.4 Cognitive - Refers to the use of the mind to store, sort, analyze, and synthesize knowledge. Examples include recalling facts, solving problems, diagnosing or trouble shooting malfunctioning equipment.

3.5 Competency - A skill or cognitive ability possessed by an employee. Examples include the following; installation of an electric or gas service, ability to complete correctly a LILCO purchase requisition.

4.0 DISCUSSION

A training needs analysis is done to determine if company problems can be solved by the training of its personnel. Needs analysis is a fact finding and investigative process used to make this determination. The information gathered to comply with this procedure is used by company personnel when investigating training solutions to company problems, and by the Director of the Office of Training in approving the decision to design and conduct training.

5.0 RESPONSIBILITY AND AUTHORITY

5.1 The Director, Office of Training (DOT) has the responsibility and authority to obtain appropriate authorization for the appropriation of funds for the development or major revision of training programs. He has the responsibility for directing the establishment of Training Program Development Teams.

5.2 LILCO Department Managers and company officers have the responsibility and authority to request the application of the training function to company problems.

5.3 The Manager, Training Services is responsible for coordinating the processing of this procedure.

5.4 The Training Program Development Team is responsible and has authority to evaluate requests for new training programs or major revisions of existing programs; formulate the preliminary and final estimate of the cost for developing training programs; make recommendations to the Director, Office of Training concerning the development and major revision of training programs.

LILCO LONG ISLAND LIGHTING	OFFICE OF TRAINING PROCEDURES	OTP 2.02 REV. 1 Effective Date 12-30-88

TITLE: CONDUCTING JOB ANALYSIS

1.0 PURPOSE

This procedure provides methods for conducting a job analysis, discusses advantages and disadvantages for using each method, states how tasks are included in the training program curricula, provides for record keeping of the data collected, and designates the responsibility and authority needed to implement this procedure.

2.0 SCOPE

This procedure can be applied to the development of a new training program or the major revision of an existing program. This procedure shall be applied to all programs that are to be submitted for INPO accreditation (with the exception of those programs designated by INPO to be non-task based) and may be used for other programs as deemed appropriate by the Director, Office of Training.

3.0 DEFINITIONS

3.1 Job/Position - The terms job and position are used interchangeably in this document. The job is the sum of all the required tasks performed by an employee assigned to the position responsible for accomplishing the job.

3.2 Duty area - A duty area is a group of related tasks that identifies a recognizable subdivision of the job. Grouping the tasks into duty areas is performed in anticipation of using this data to form a curricula. An explanation of a duty area is as follows. There may be a number of tasks that are performed in the operation of a plant system, such as the Condenser Air Removal System. All these tasks would be sequenced and grouped under a duty area titled Operation of The Condenser Air Removal System.

3.3 Task - A task is a well defined unit of work, having an identifiable beginning and end, which is accomplished by performing two or more steps.

3.4 Step/Element - The word step is used interchangeably with the word element. A step is an action taken to perform task. Steps involve the use of a skill and usually some knowledge.

APPROVED BY/DATE Jeffrey L. Smith 12/5/88

Examples of tasks and constituent elements:

Task: Repair motor operator on valve; Initiate the high pressure coolant injection system; Back wash the main condenser.

Each of the above tasks requires many actions (steps/elements), to be carried out in order for the task to be accomplished.

Steps/elements remove bolts
replace bolts
lubricate bearings
operate control switch
open valve
start pump

3.5 Comprehensive task list - A list of all the tasks statements identified by a job analysis method.

3.6 Task selected for training list - A list of task selected for inclusion in the curricula of a training program.

3.7 Curricula - The sum total of all the lessons, units, and courses that make up the content of a training program. The curricula addresses all the tasks that are selected for training.

4.0 DISCUSSION

4.1 The basis for doing performance based training is founded in the following assumptions.

- o The curricula of a performance based training program is directly supportive of the tasks executed by the trainee while on the job.
- o By instructing the steps, skills and knowledge required to do a task along with practice of the task a trainee has the best opportunity to master the task.
- o Because of the direct observation of the trainee's task performance during the training program a credible evaluation of the trainees ability to execute the task competently on the job can be assumed.

4.2 Job analysis identifies the tasks to which the performance based training program is directed. Several methods are available for identifying tasks, each of which has its advantages and disadvantages. Additionally, several job analyses have been conducted within the industry and the data collected is often available. It is beneficial to investigate existing job analysis data for the same or similar job.

4.3 The job analysis process also discriminates between those tasks that warrant training and those that do not. Most commonly, three factors are addressed to make such a discrimination; importance/criticality, frequency and difficulty.

4.4 Job analysis requires both the expertise of training professionals and job incumbents, often referred to as subject matter experts, to ensure valid results from the process.

5.0 RESPONSIBILITY AND AUTHORITY

5.1 The Director, Office of Training is responsible and has the authority for directing the establishment of a Training Program Development Team for the purpose of implementing this procedure. The Training Program Development Team as defined in OTP 2.01 is responsible for implementation of this procedure.

5.2 The organization requesting the training, the training department designated by the DOT to manage the project, and the Program Development Section shall each provide sufficient staff to implement this procedure in the time frame agreed upon by the TPD team.

5.3 The Performance Measurement Supervisor is responsible for Maintaining and updating the LILCO Training Inforamtion Management System (LITMS).

6.0 REFERENCES

6.1 Institute of Nuclear Power Operations
INPO 83-033 "Job and Task Analysis Users Manual" September, 1983.

6.2 INPO 85-006 "Principles of Training System Development" February, 1985.

6.3 "Dacum Identifying Competencies", A. Miller Beach April, 1980, School Shop Publication.

6.4 Figuring Things Out - A Guide to Needs and Task Analysis, Zemke, R. and Kramlinger, T., Addison - Wesley Publishing Co., 1986, Reading, MA.

6.5 Goal Analysis, Mager, R.F., Fearon Pitman Publishers, Inc. Belmont, CA, 1972.

6.6 LITMS Job/Task Analysis Handbook.

7.0 ACTIONS

7.1 Selecting a Method to Conduct Job Analysis

7.1.1 Method 1 - Job analysis using job surveillance

LILCO LONG ISLAND LIGHTING	OFFICE OF TRAINING PROCEDURES	OTP 2.03 REV. 1 Effective Date 3/15/89

TITLE: CONDUCTING TASK ANALYSIS

1.0 PURPOSE

The purpose of this procedure is to establish the method for conducting task analysis. In addition, it designates the responsibility and authority needed to implement this procedure.

2.0 SCOPE

This procedure can be applied to the development of a new training program or the major revision of an existing program. This procedure shall be applied to all programs that are to be submitted for INPO accreditation (with the exception of those progrms designated by INPO to be non-task based) and may be used for other programs as deemed appropriate by the Director, Office of Training.

The instructions given in this procedure may be used to analyze task when performing minor program revision, however it is not necessary to establish a training program development team.

3.0 DEFINITIONS

3.1 Task - A task is a well defined unit of work, having an identifiable beginning and end, which is accomplished by performing two or more steps.

3.2 Step/Element - The word step is used interchangeably with the word element. A step is an action taken to perform a task. Steps involve the use of a skill(s) and usually some knowledge.

3.3 Comprehensive task list - A list of all the task statements identified by a job analysis method.

3.4 Task selected for training list - A list of tasks selected for inclusion in the curricula of a training program.

3.5 Subject matter expert (SME) - A job incumbent or other individual possessing the competencies of the job.

4.0 DISCUSSION

4.1 Task analysis identifies the detailed skills and knowledge requirements of a task so as to provide the content for a performance based training program. The task analysis should include task elements, conditions, standards, initiating cues, tools and equipment, references, and skills and knowledge necessary for the performance of each task on the tasks selected for training list.

APPROVED BY/DATE [signature] / March 2, 1989

4.2 Several task analyses have been conducted within the industry, and the data collected is often available. The use of existing task analysis data can greatly reduce the time necessary to perform task analysis.

5.0 RESPONSIBILITY AND AUTHORITY

5.1 The Director, Office of Training is responsible and has the authority for directing the establishment of a Training Program Development Team for the purpose of implementing this procedure. The Training Program Development Team as defined in OTP 2.01 is responsible for implementation of this procedure.

5.2 The organization requesting the training, the training department designated by the DOT to manage the project, and the Program Development Section shall each provide sufficient staff to implement this procedure in the time frame agreed upon by the TPD team.

6.0 REFERENCES

6.1 Institute of Nuclear Power Operations INPO 83-033 "Job and Task Analysis Users Manual" September, 1983

6.2 INPO 85-006 "Principles of Training system Development" February, 1985

6.3 Zemke, R. and Kramlinger, T. Figuring Things Out-A Guide to Needs and Task Analysis. Reading, Ma.: Addison - Wesley Publishing Co., 1982.

6.4 LILCO Training Information Management System (LTIMS) Job/Task Analysis Handbook. Rev. 0.

7.0 ACTIONS

7.1 Obtain task analysis worksheets (Appendix 8.1), one for each task to be analyzed. The form will provide space to record:

- subject matter expert, interviewer,
- name of person entering data in computer,
- task number,
- task title,
- conditions and standards of performance,
- tools/equipment required to perform task,
- initiating and terminating cues
- specific procedures/references required to perform task,
- task output
- consequences of error
- human interfaces
- personnel safety concerns
- skills/knowledge numbers and titles
- element numbers, and sequence of task elements
- element titles and association information

LILCO LONG ISLAND LIGHTING	OFFICE OF TRAINING PROCEDURES	OTP 2.04 REV. 1 Effective Date 12-30-88

TITLE: MODIFICATION OF TASK SELECTED FOR TRAINING LIST

1.0 PURPOSE

1.1. The purpose of this procedure is to provide directions for making changes to a task selected for training list.

2.0 SCOPE

This procedure shall be applied to all programs that are submitted for INPO accreditation (with the exception of those programs designated by INPO to be non-task based) and may be used for other programs as deemed appropriate by the Director, Office of Training.

3.0 DEFINITIONS

3.1 Task selected for training - A list of tasks selected for inclusion in the curricula of a training program.

4.0 DISCUSSION

From time to time changes need to be made to an approved task selected for training list; new tasks may become part of the original job that was analyzed, tasks may no longer be performed as originally defined, or a task as originally stated on the list may be found to require rewording to make its intent more clear. These and other reasons for changing the approved list will originate from the feedback process of the systems approach to training.

5.0 RESPONSIBILITY AND AUTHORITY

5.1 The Performance Measurement Supervisor is responsible for maintaining and updating the LILCO Training Information Management System (LITMS).

5.2 Training Section Supervisors are responsible for obtaining approval for all changes to the task selected for training lists.

6.0 REFERENCES

6.1 Institute of Nuclear Power Operations INPO 85-006 "Principles of Training systems Development" February 1985

7.0 ACTIONS

7.1 Two Year Review of Task Selected for Training List.

APPROVED BY/DATE Jeffrey L. Smith 12/5/88

ILCO	OFFICE OF TRAINING PROCEDURES	OTP 3.03 REV. 0 Effective Date 4/06/87

TITLE: ESTABLISH ENTRY LEVEL SKILLS AND KNOWLEDGE

1.0 PURPOSE

This procedure provides directions on how to determine the competencies of prospective students as they apply to a new course or program, and how such information can be used in the development, modification, and implementation of training programs.

2.0 SCOPE

This procedure describes how to develop diagnostic tests for determining entry level competencies of prospective students and how to analyze test results and apply the findings to development, modification, and implementation of a training program.

3.0 DEFINITIONS

3.1 Diagnostic test - a test to measure a student's readiness in skill and knowledge to enter a structured training program.

3.2 Knowledge - the ability to process facts, principles, or concepts.

3.3 Skill - the ability to perform a physical action or manipulation.

4.0 DISCUSSION

In the design phase, after test items for the program are constructed, a diagnostic test is developed and administered to a representative group of prospective students. Results from the diagnostic test are used to confirm that student applicants possess skills and knowledge requisite to successful participation in the training program. Results are also used to confirm that objectives are prepared at a level consistent with expected entry-level skills and knowledge. Diagnostic testing helps ensure that time and resources are conserved by avoiding unnecessary training, and by starting at a level that will permit students to complete training successfully.

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In the design phase, the diagnostic test serves to perform the following functions:

1) tailor the training program to meet the needs of prospective students.

2) screen prospective students who would need to have extensive remedial training or cause the class to progress much slower than planned.

Established programs are primarily modified or changed through the process described in OTP 8-03, "Training Revision Process." Established programs may have to be modified if the qualification standards for entry are permanently altered in either an upward or downward direction.

5.0 RESPONSIBILITY AND AUTHORITY

The Director, Office of Training appoints a specific training program development team (TPDT) to develop a diagnostic test for a designated program.

The TPDT is responsible for the implementation of this procedure.

6.0 REFERENCES

INPO, 85-002, Institute of Nuclear Power Operations, "Principles of Training System Development," February 1985

7.0 ACTIONS

7.1 Determine the need for a diagnostic exam.

7.1.1 A TPDT (appointed by the Director) shall determine the necessity for a diagnostic test.

7.1.1.1 Once a diagnostic test has been deemed necessary, the Director, Office of Training appoints either the same or a new team to develop the diagnostic test.

7.2 The diagnostic test should be composed of test items that measure skills and knowledge considered requisites to the training program. Standard diagnostic exams from national organizations may be used if applicable to a designated program.

LILCO LONG ISLAND LIGHTING	OFFICE OF TRAINING PROCEDURES	OTP 4.01 REV. 1 Effective Date 11/30/88

TITLE: PREPARATION, REVIEW, AND APPROVAL OF LESSON PLANS

1.0 PURPOSE

This procedure provides directions and assigns responsibility for the development and approval of lesson plans used to control training conducted by Office of Training personnel.

It provides the basic requirements and methodologies used by the Office of Training to establish the process and format in the development, approval, and use of lesson plans.

2.0 SCOPE

The scope of the procedure includes the development, review, and approval of instructional courses. It explains the format and each main section of the lesson plan. It applies to programs being submitted for the Institute of Nuclear Power Operations (INPO) accreditation, and may be applied to other programs as deemed appropriate by the Responsible Training Section Supervisor. |1

3.0 DEFINITIONS

3.1 Program - A program is the entire sequence of training associated with either a topic, skill area or job classification. When instruction is designated as a program, it implies that the instruction has been grouped into subdivisions called courses. Examples: Licensed Operator Training is composed of several courses, Refresher Academics, Theory, Systems, Procedures, etc. General Employee Training is composed of several courses, GET Level I (nonradworker), GET Level II (radworker), and GET Visitor Level II (escorted access to RCA) etc. which address a wide variety of related program content. |1

3.2 Course - A course is a unit of instruction requiring several days or weeks of instructional time and consisting of a single skill or topic area (such as introduction to electronics).

3.3 Module - A topic of instruction shorter than a course but longer than one lesson. It is possible for a module to be formatted as a lesson and conducted over several days to allow both the instructor and the student to follow the continuity of a complete topic.

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3.4 Lesson Plan - A lesson plan is a written guide of instruction sequenced with sufficient detail to allow replicability. That is, any instructor using a lesson plan should provide the same exercises, content, and objectives; and the student performance results should be no different than would be the case if the same instructor re-taught the lesson using that plan. A lesson plan may focus on a single or multiple objectives, depending on the complexity of the objectives and the time permitted.

3.5 Instructor's Notes - Notes to the instructor are contained within lesson plans and function as indicators of instructional methods or as actions that should be taken before this lesson is re-taught. Notes may be embedded within the content outline.

4.0 DISCUSSION

It is the aim of the Office of Training to formalize training in a cost effective manner. However, it should be mentioned that it is not possible to formalize all activities that may be considered training, such as a supervisor's instructing qualified employees on improving their job skills in the normal course of work. In some cases, formalization may not be reasonably attainable for the time available. Training for a one-time problem, which must be conducted on short notice, is an example of such a condition.

Formalized training is reviewed and approved by appropriate personnel to ensure technical accuracy and instructional adequacy. Directions for such reviews and approvals are presented in this procedure. In the five phase systematic approach to training, lesson plans are the culmination of the first two phases: analysis and design; and are constructed during the development phase. They identify the learning objectives, student activities, equipment and materials needed for training; and they provide guidance for the appropriate usage of these items in the next phase: implementation. The last phase is evaluation, which involves testing the objectives taught in the lesson plan during implementation.

The effective use of lesson plans ensures consistency in the delivery of training from instructor to instructor and from class to class.

5.0 RESPONSIBILITY AND AUTHORITY

5.1 Office of Training section supervisors are responsible for lesson plans. This includes allocation of resources, supervision during development, assurance of instructional approval, assurance of technical approval, supervision of classroom implementation, revision, and records maintenance. Office of Training Section Supervisors are responsible for ensuring that lesson plan development, approval, and revision comply with this procedure.

LILCO LONG ISLAND LIGHTING	OFFICE OF TRAINING PROCEDURES	OTP 6.01 REV. 3 Effective Date 10/31/88

TITLE: EVALUATION OF TRAINING PROGRAM EFFECTIVENESS

1.0 PURPOSE

The purpose of this procedure is to provide directions for evaluating the effectiveness of training programs delivered by or for the Office of Training on Long Island, and to assign responsibility for implementing the evaluation process.

2.0 SCOPE

Implementation of this procedure is limited to those programs conducted at LILCO facilities and locations within its service area. Application of this procedure to non-accreditated programs and to programs conducted elsewhere is at the discretion of the Director, Office of Training.

This procedure:

- Designates the Office of Training positions which are responsible for the solicitation, collection, review, disposition, documentation, and processing of written comments pertinent to training program effectiveness.
- Provides directions for soliciting evaluations of training program effectiveness from students, instructors, and supervisory personnel both during and upon completion of the training program.
- Provides directions for collecting comments on training program effectiveness from students and user group supervisory personnel three months after completion of training.
- Provides directions for initiating the review and evaluation of comments on training program effectiveness.
- Provides directions for conducting a comprehensive program evaluation.

3.0 DEFINITIONS

None

APPROVED BY/DATE Jeffrey S. Smith 10/31/88

4.0 DISCUSSION

A critical element in a systematic approach to training is collecting and dispositioning feedback from students, job incumbents, job supervisors, and instructors concerning the effectiveness of training relative to job performance requirements. The periodic collection of this feedback, both during and after training, and the analysis of the data can assure that training programs are not only instructing on the skills and knowledge needed for the job, but are responsive to the suggestions, recommendations, and constructive criticisms aimed at improving the quality of instruction. The actions which follow in section 7.0 of this procedure are the directions which ensure that the training program effectiveness evaluation process is efficiently carried out. The following actions are included.

4.1 Obtaining Comments on Training Program Effectiveness During and upon conclusion of Training.

4.2 Obtaining Comments on Job Performance three months After Completion of Training

4.3 Preparation of Student and Supervisor Comment Forms

4.4 Initiating the Review of Collected Training Program and Job Performance Comments

4.5 Evaluating the overall program effectiveness

5.0 RESPONSIBILITIES

5.1 The program development supervisor or designee is responsible for ensuring the following:

- o Comments on training programs are solicited from appropriate personnel during and after the completion of Office of Training programs.
- o Comments on training program effectiveness are promptly collected and summarized during and after the completion of Office of Training programs.
- o Summaries of collected comments on training program effectiveness are input as information documents into the process described by OTP-6.02, "Receipt, Evaluation, Disposition, and Documentation of Information Affecting LILCO Training Programs."

5.2 Office of Training section supervisors or designees are responsible for the following:

- o Revieving summarized comments on training programs

APPENDIX H

MEDIA LOCATOR SHEET

The Summit Authoring System diskette containing the student learning program referred to in this project is available at the office of the graduate program in Master of Science in Training and Learning Technology, New York Institute of Technology, Old Westbury, New York. The student disk type is double density, 3 and 1/2 inch.

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